

PM TEST: MPG CHAMPS

HYBRID VS. DIESEL

245^{MPH!}

JAY LENO'S
JET CAR



Science Technology Automotive Outdoors Home

Popular Mechanics

BREAKTHROUGH AWARDS '09

THE YEAR'S BEST

INVENTIONS

PLASMA ROCKET

DIY WIND
POWER

SUPERCOPTER

FLYING
CAR

(FOR REAL
THIS TIME!)



GYRO ROBOT

FUTURE GAMING

ENGINEERING
SUPERSTAR

SPACE TELESCOPE



... AND THE INVENTORS
WHO ARE CHANGING THE WORLD

**AVAILABLE V-6 POWER WITH 3500-LB
TOWING CAPACITY*, SEATING FOR 5 ADULTS.**

**IT TESTED POSITIVE FOR
PERFORMANCE-ENHANCING
ENGINEERING.**



It's everything you love about the SUV, in a smaller, more capable package. Of course, it has the powerful engineering you'd expect of a GMC. It's full of premium content, including a rear-vision camera, standard. And it offers the unexpected efficiency of a 32 hwy mpg rating.** How did we do it? We gave it more ideas per square inch. Because more is what we do. INTRODUCING THE ALL-NEW TERRAIN. THE SMALLER SUV, FROM GMC. **WE ARE PROFESSIONAL GRADE.**

*Maximum trailer ratings are calculated assuming a properly equipped base vehicle, plus driver. See dealer for details. **Based on EPA estimates for the FWD model with standard 2.4L I4 engine.
©2009 General Motors. All rights reserved. GMC® GMC logo® Terrain™ WE ARE PROFESSIONAL GRADE®



GMC ■
TERRAIN

Can synthetic blend SAE 10W-30 or 10W-40 diesel engine oil help enhance the performance of my engine?

Yes. Synthetic blend SAE 10W-30 or 10W-40 diesel engine oil such as the new Shell Rotella® T5 Synthetic Blend Technology may offer enhanced engine cleanliness and excellent wear protection in the hottest summer heat and the coldest winter freeze. This is possible through a combination of additives and synthetic blend technology base oil.

Synthetic blend oil provides protection in critical areas by helping to control acid, deposits and wear. Synthetic blend oil helps protect against acids which are formed as fuel burns. Wear control also contributes to engine life by keeping metal surfaces apart.

Synthetic blends are often offered in lower viscosity grades such as SAE 10W-30 or 10W-40 compared to conventional SAE 15W-40 oil so it will thicken less at colder temperatures. Quick oil flow in the engine at startup is important particularly in cold-climate conditions as improved fuel and injection-system controls in newer diesel engines reduce the time it takes to start your engine. A synthetic blend SAE 10W-40 or 10W-30 flows better than a conventional SAE 15W-40 diesel engine oil in a

cold engine. Synthetic blend engine oil also maintains its viscosity under high temperatures, allowing it to provide strong protection under hot operating conditions.

Increased fuel efficiency is possible with synthetic blend SAE 10W-30 engine oil when compared to conventional SAE 15W-40 engine oil because it can increase flow capability, therefore reducing the energy used to pump the oil through the engine.

Shell Rotella® T5 Synthetic Blend Technology is an innovative heavy duty engine oil developed by Shell Lubricants designed to deliver fuel economy savings, enhanced engine cleanliness, and excellent wear protection.

Shell Rotella® T5 Energized Protection™ oil meets API CJ-4 specifications for increased compatibility with the latest exhaust-emissions control systems. API CJ-4 synthetic blend engine oils are suitable for use in most heavy duty diesel engines manufactured prior to 2007.



The term "Shell Lubricants" collectively refers to the companies of the Shell Group that are engaged in the lubricants business.



SHELL ROTELLA[®]T
ENERGIZED PROTECTION[™]



**HOWEVER TOUGH,
SHELL ROTELLA[®] ADAPTS.**

www.ROTELLA.com

DESIGNED TO MEET CHALLENGES





× NOVEMBER

Tool Time



EXPERT ADVICE From auger bits to wainscotting, our home experts have compiled hundreds of expert tips on how to work with tools and materials, plus shortcuts and advice for all home do-it-yourself projects.

Check in weekly for tips on saving energy with insulation tricks, new home electricity monitors and climate-control work-arounds. Also look for our advice on best practices with modern GFCIs, classic handsaws and caulk guns.

popularmechanics.com/tooltips

TOOL COMPARISONS We know that picking the right tool for the job means finding the best, toughest and most appropriate designs for a given DIY task. That's why we round up the newest products, like oscillating hand tools, and pit them against the classics—orbital sanders, circular saws and angle grinders—in home projects.

popularmechanics.com/home_journal

ABUSIVE LAB TESTS When a standard, side-by-side tool and gadget comparison just isn't enough, we get abusive. Whether it's testing the safest goggles, the most powerful blenders or rugged cellphones, we'll make sure to take it one step too far, crushing, cracking and drowning products to find a winner.

popularmechanics.com/abusivelabtest

PHOTOGRAPH BY ZACH DESART

MICHELOB
BREWING CO.

CRAFTING A BETTER BEER

Available for a limited time, the Michelob Fall/Winter Sampler Pack highlights differences within Ale styles. This experiential package includes our Pale Ale, Porter, Bavarian Wheat and Rye-PA and features an in-pack flighting sheet with food pairings, plus instructions on how to participate in an online interactive tasting with our Brewmaster.



For more information, visit
michelobbrewingcompany.com

Love
Your Car?
You'll Love
"My Wheels"



Join myWheels, the new user-powered auto community on popularmechanics.com

Submit your car for the "Castrol EDGE Car of the Month", share photos, swap tips and more.

Register and be automatically entered to win a Magellan Maestro GPS system and a year's worth of Castrol EDGE motor oil. An estimated \$550 value!

For official rules and information, visit www.popularmechanics.com/myWheels



No purchase necessary. The Popular Mechanics Castrol Auto Club Sweepstakes Sponsored by Hearst Communications, Inc. begins July 1, 2009 at 12:01 AM (ET) and ends December 31, 2009 at 11:59 PM (ET). Odds of winning will depend upon the total number of eligible entries received. Open to legal residents of the 50 United States and D.C. who have reached the age of majority in their state of residence at time of entry. Void in Puerto Rico and where prohibited by law. Sweepstakes subject to complete official rules available at popularmechanics.com/myWheels

**Popular
Mechanics**

READER'S
CHOICE
AWARD
09

**PM READERS: CHECK OUT THE BRAND WINNERS
OF THE 2009 PM READERS CHOICE AWARDS AT**
Popularmechanics.com/readerschoice09

— FOAM IS LIKE THE —
BREWMASTER'S AUTOGRAPH.



Great beer leaves a mark. It starts as a thick, foamy head in a perfectly clean glass. Then with every sip, foam clings to the side of the glass, leaving what is known as lacing. It's a sign the brewmaster has done everything right. Great foam, in addition to great taste, is the signature of every beer Michelob brews.



Michelob



CRAFTING A BETTER BEER.

PopularMechanics

JAMES B. MEIGS
Editor-In-Chief

Executive Editor David Dunbar
Design Director Michael Lawton

EDITORIAL

Editor, Automotive Ben Stewart
Senior Editor, Automotive Mike Allen
Senior Editor, Home Roy Berendsohn
Senior Editor, Science Jennifer Bogo
Senior Editor, Technology Glenn Derene
Detroit Editor Larry Webster
Associate Editors Joe Pappalardo,
Seth Porges, Harry Sawyers
Research Director David Cohen
Assistant Editor Erin McCarthy
Assistant to the Editor-In-Chief Allie Haake

Contributing Editors:

Jim Gorman, Chris Grundy, Ben Hewitt,
Carl Hoffman, Alex Hutchinson, Joel Johnson,
Tom Jones, S.E. Kramer, Jay Leno,
Fred Mackerodt, The MythBusters
(Jamie Hyneman, Adam Savage), Joe Oldham,
Glenn Harlan Reynolds, Noah Shachtman,
Erik Sofge, Kalee Thompson, Joseph Truini,
James Vlahos, Logan Ward, Jeff Wise

Deputy Editor Jerry Beilinson
Managing Editor Michael S. Cain

ART

Senior Art Director Peter Herbert
Associate Art Director Stravinski Pierre

PHOTOGRAPHY

Director of Photography Allyson Torrisi
Associate Photo Editor Michele Ervin

PRODUCTION

Assistant Managing Editor Emily Masamitsu
Copy Editor Robin Tribble

IMAGING

Digital Imaging Specialist Anthony Verducci

POPULARMECHANICS.COM

Online Director Angela Diegel
Online Editor Tyghe Trimble

PROJECT ASSISTANT

Alyson Sheppard

INTERNS

Simi Mahtani, Lisa Merolla, Alex Nazari,
Adri Ramdeane

Contributing Photographers & Illustrators:

Burcu Aysar, Tim Bower, Gordon Chapman/
Studio Catastrophic FX, Brad DeCecco, Dogo,
Chad Hunt, Scott Jones, Ed Keating, Axel de Roy,
Dan Saelinger, Gabriel Silveira, Sinelab,
Art Streiber, Transluzent, Dan Winters

SUBSCRIPTIONS

subscribe.popularmechanics.com

BILL CONGDON
Publisher

Associate Publisher Jane Wladar | *General Manager* Bruce A. Mitnick
Executive Marketing Director Mike Kresch

Online Advertising Director Matthias Wolf
Marketing Manager Claire Rottino
Associate Marketing Manager Johanna Hessling
Group Production Director Karen Otto
Group Production Manager Carole Hartman
Associate Production Manager Karen Nazario

Creative Director Glen Fuenmayor
Marketing Manager Chad Meany
Online Marketing Coordinator Janette Hong
Vice President, Group Consumer Marketing
Director Rick Day
Advertising Coordinator Carolyn Yanoff

ADVERTISING SALES OFFICES

NEW YORK

East Coast Sales Manager Ray Rienecker 212/649-2876
Account Manager Matthew Schwagerl 212/649-2902
Special Sections Sales Samantha Yarock 212/649-2850
Sales Assistant Vanda Danbunpoth 212/649-2853

CHICAGO

Manager Spencer J. Huffman 312/984-5191
Account Manager Matt Avery 312/251-5355
Sales Assistant Yvonne Villareal 312/984-5196

DIRECT RESPONSE ADVERTISING

Angela Honopoulos 212/649-2930
Tim Fountain 212/649-2929

LOS ANGELES

Account Manager Brittany Marquis 310/664-2921
Sales Assistant Cari Nelson 310/664-2922

DETROIT

Manager Robert Reynolds 248/614-6120
Sales Assistant Toni Starrs 248/614-6011
Hearst Magazines Sales, Inc.

DALLAS

Account Manager Patty Rudolph 214/824-9008
Weikel Media

SAN FRANCISCO

Northwest Manager Andrea Weiner 415/859-5565
Athena Media Partners

CLASSIFIED ADVERTISING REPRESENTATIVE

Kathleen Gleason 888/473-0788; fax: 708/352-4094
Klassmark, 52 W. Burlington Ave., La Grange, IL 60525

PUBLISHED BY THE HEARST CORPORATION

Frank A. Bennack, Jr.
Vice Chairman & Chief Executive Officer

George R. Hearst, Jr.
Chairman

HEARST MAGAZINES DIVISION

Cathleen Black
President

Michael Clinton
*Executive Vice President,
Chief Marketing Officer
& Group Publishing Director*

John P. Loughlin
*Executive Vice President
& General Manager*

Gilbert C. Maurer
Publishing Consultant

Mark F. Miller
Publishing Consultant

how to reach us

E-Mail popularmechanics@hearst.com. **Mail** Popular Mechanics, 300 W. 57th St., New York, NY 10019-5899. **Fax** 646-280-1081. Please include your name, address and a daytime phone number. Letters may be edited. **Subscription Questions** For customer service, change of address and subscription orders, log on to service.popularmechanics.com, or write to Customer Service Department, Popular Mechanics, P.O. Box 7186, Red Oak, IA 51591-0186. **Back Issues** Call 800-925-0485, or write to Hearst Single Copy Sales, P.O. Box 7763, Red Oak, IA 51591-0186. **Reprints** Call 800-659-9878.

EDITORIAL BOARD OF ADVISERS

POPULAR MECHANICS is grateful to these scientists, innovators and leaders, who help ensure we cover the most important stories in the most authoritative way.

BUZZ ALDRIN

Apollo 11 astronaut; colonel, U.S. Air Force (Ret.)

SHAWN CARLSON

Executive director of the Society for Amateur Scientists; MacArthur Fellow

DAVID E. COLE

Chairman, Center for Automotive Research

THOMAS D. JONES

Space shuttle astronaut; author of *Sky Walking*

DR. KEN KAMLER

Surgeon; author of *Surviving the Extremes*

GAVIN A. SCHMIDT

Climate modeler, NASA Goddard Institute for Space Studies

AMY B. SMITH

MIT instructor; leader in appropriate technology movement

DANIEL H. WILSON

Robotics; author of *Mad Scientist Hall of Fame*

WM. A. WULF

President, National Academy of Engineering

WHAT THEY'RE DOING



✱ SAUL GRIFFITH

Chief scientist, Other Lab; MacArthur Fellow

This year, Griffith launched OtherLab.com to develop home-energy conservation strategies and technology. The inventor and physicist also added new features to his online energy calculator, WattzOn.com, allowing users to input data from their power bills to get a more accurate carbon-footprint estimate. And he continues to work with Makani Power on research into harvesting energy from high-altitude winds.



WHEN YOU PEAK, YOU WIN.™

Whatever you drive,
PEAK® can take it on.
PEAK® Long Life® Antifreeze
is formulated with an
advanced organic technology
to protect the engine of any
car or light truck for
5 years or 150,000 miles*.

Danica Patrick
IndyCar® Series Driver
and PEAK® Spokesperson



Available at these and other fine retailers:



*A complete cooling system flush and fill, and compliance with coolant maintenance specified in vehicle's owner's manual (including top-offs) are required.

Need Motor Oil or Windshield Wash?
Look for these other
PEAK® Performance Products.

Official Motor Oil
of the



and the
Indianapolis 500®

www.peakauto.com



©2008 DuPont Industries, Inc. Indianapolis 500 and IndyCar (and Design) are registered trademarks of Speedway Enterprises, Inc., used with permission.

THE ONLY LED
TV WITH PICTURE
SO REAL IT
EARNED THX
CERTIFICATION.

The technology of LG
LED TVs that delivers
deeper blacks, richer
colors, and vivid clarity
now comes with something
better: THX certification.
So whether it's an awe-
inspiring scene or the
striking detail of an even
more striking animal, LG's
LED TVs display it with
stunning picture quality.

So, is it a TV?
Or something better?

LGusa.com



62 2009 Breakthrough Awards

PM celebrates the year's greatest innovations, from a battery made of dirt to the world's fastest helicopter. Plus: Ten game-changing products.

BY LOGAN WARD



Greg Schroll's Breakthrough Award-winning robot is a remote-control sphere that can navigate rugged terrain. Schroll envisions his technology being used to monitor hazardous waste sites and explore alien planets.

78 Working in Stone

Revisiting an era when fathers and sons took the time to work on projects together, PM senior editor Roy Berendsohn uses a big pile of stones—and lessons from his childhood—to build a bench for his dad.

BY ROY BERENDSOHN

84 Mileage Masters

We take five fuel-efficient vehicles for a weeklong spin to see which ones perform best on city streets, lonely desert highways and twisty back roads.

BY BEN STEWART

90 Home Theater Made E-Z

Hi-def was only the beginning. New TV tech and online content are bringing better quality and selection to the living room, but also amping up the complexity. PM cuts through the jargon.

BY SEÁN CAPTAIN



ON THE COVER

Sikorsky Aircraft engineers designed the X2 helicopter to hit record-breaking speeds of 287 mph. (Top speed for conventional helicopters: about 185 mph.) POPULAR MECHANICS commissioned Jeremy Cook to render the X2, one of our 2009 Breakthrough Award winners.

TECH WATCH

15 Cars for the Blind

Vision-impaired test drivers in a specially rigged dirt buggy outgun sighted drivers. **Plus:** Scientists scramble for answers after a mysterious object collides with Jupiter.

UPGRADE

27 Nano Technology

Apple's new iPod Nano is the first to shoot video—without a bump in price or size.

Plus: Record all day—literally—with the hi-def, 64 GB Canon Vixia HF S11; lock pliers undergo the PM Abusive Lab Test.

NEW CARS

35 Rising Star

Buick makes an impressive comeback with the refined LaCrosse. **Plus:** The Nissan 370Z Roadster offers tight handling and plenty of cabin comfort; we take the super-charged Lotus Elise SC for a high-speed spin.

COLUMNS

48 Long-Term Test Cars The sporty Audi A4 Avant wagon joins our fleet; the Dodge Ram transports the Saturday Mechanic shop; we log high mpg in the Jetta TDI; and, so long, spunky Subaru Forester.

54 Jay Leno's Garage Jay envisions—and builds—a jet-engine-powered supercar.

LISTED ON THE COVER:

84 MPG Champs **///** **54** Leno's Jet Car **///**
62 Breakthrough Awards '09:
Year's Best Inventions and the Inventors
Who Are Changing the World

HOME

95 Mastering Crown Molding

Transform the look of any room with these trim-installation tips.

100 Homeowners Clinic

How to mount a laminate kitchen backsplash.

Plus: Dents, cracks and holes—our chart helps you find the right filler for the job.



AUTO

107 Saturday Mechanic

How to keep your tire-pressure monitoring system functioning properly.

112 Car Clinic

Low-cost (and effective) alternatives to irksome magnetic screwdrivers. **Plus:** Use the lemon law to jump-start delayed auto work.

TECH

121 The Beauty of Ethernet Cable

Tired of unreliable Wi-Fi? Wire your house with dependable Ethernet.

124 Digital Clinic

How to remove dust from your camera sensor. **Plus:** Cracking open a Mac Pro tower's disc drive.

IN EVERY ISSUE

HOW TO REACH US	6
LETTERS	12
THIS IS MY JOB	136



IT SPEAKS TO YOU. **LITERALLY.**

The sweeping cabin surrounds you. The massaging front seats* invigorate your senses. And then there's the hands-free, voice-activated, voice-responding SYNC*** communications and entertainment system. Technology that perfectly connects you to what you love: driving. We speak car. We speak innovation.

INTRODUCING THE ALL-NEW
TAURUS



Drive one.
fordvehicles.com

*Available. **Optional. Driving while distracted can result in loss of vehicle control. Only use mobile phones and other devices, even with voice commands, when it is safe to do so.

Engineering's Wild Side

"The MythBuster Guide to Gonzo Engineering" was wonderful. Yes, the explosions on their show are cool, but I love learning about the science behind the myths. It really outlines the scientific method—Adam and Jamie have a problem, formulate a hypothesis and test it to see if they can validate the myth. They are not afraid to say it's cool to like science.

EDWARD WALKER
BEALETON, VA

I couldn't agree more with Jamie's and Adam's tips in your MythBuster issue—especially having an LED flashlight with you at all times. And amen to buying better tools. After going through three drills, I finally bucked up and bought a DeWalt driver, which is going on seven years now. And I can't wait to build the nesting table Jamie designed—saving space in my makeshift, cobbled-together workshop is a must.

CHARLES SELBE
OCEAN CITY, MD



ISSUE

09/09

Readers responded to our MythBuster issue, including gonzo engineering, the limits of CAD, a classic boat and dual-sport bikes.

Isn't it great we get to print feedback we like and ignore the rest?
— JAMIE

Someone get me back to life-size!
— ADAM



Your September MythBuster issue was one of the best ever. We don't have cable, and I was unaware that the MythBusters even existed, but I learned a lot from reading their stories. I would love to see articles by Jamie Hyneman and Adam Savage each month.

HAROLD COHON
MORTON GROVE, IL

Virtual Drafting Table

As a toolmaker and mechanical designer, I thought Jamie Hyneman's "Keep It Real," about the limits of computer-aided design software, was spot-on. Designers using CAD without practical experience can make beautiful, useless garbage. My latest project, the Springbarrow, is a spring-powered operator-wound wheelbarrow that gives the user motive power when he needs it to move heavy loads up a ramp or through rough terrain. The tolerances are very loose—0.010 to

0.040 inches clearance, or "slop," everywhere, for obvious reasons. This has been a five-year project, and I am just now putting it all on CAD so my vendors will have something to work with. The whole thing was originally designed on my drafting table. Jamie, keep up the good work.

MIKE GRAY
ALBANY, OR

The Soul of Scout

Thank you for the chill that ran down my spine when I read Roy Berendsohn's story, "To Build a Boat." My father always loved boats. He loved to build them, own them, sell them and pilot them. I once asked why he had such an obsession, and he told me about a rowboat he'd built from plans in *POPULAR MECHANICS*. I never, in a million years, thought that I would see the boat he described. But when I saw the photo of the May 1937 issue's "Building the Biloxi Dinghy," there it was! Now I understand why the first boat he ever owned as an adult was named *Sea Scout*. Thanks for the connection with my dad—I almost felt like I was there, holding a piece of wood in place, watching as he carefully checked to make sure it fit.

TERRY DECKER
LOUISVILLE, KY

Dual in the Desert

Awesome that PM is taking the time to tackle my favorite subset of the best transport in the world ("Dual to the Death"). Dual-sport bikes are amazing for fun factor, ease of operation and utility. You can't ask for much more here in Arizona!

JEFF FEARNOW
TUCSON, AZ

what do you think?

Write to Us Include your full name, address and phone number, even if you correspond by e-mail. Send e-mail to popularmechanics@hearst.com. All letters are subject to editing for length, style and format.
Subscribe Please go to subscribe.popularmechanics.com.

IF THE ECONOMY IS THE ONLY THING THAT STINKS,

YOU'RE A MITCHUM MAN.



SUPERIOR-STRENGTH PROTECTION WITHOUT THE PRESCRIPTION-STRENGTH PRICE.

Learn more at stayonyourfeet.com/popular

GRANITE MILL MANAGER.

WALK-A-THON VOLUNTEER.
YOUTH FOOTBALL COACH.
WEEKEND HIKER.

< The Timberland PRO® Endurance work boot with **Anti-Fatigue Technology** and **PowerFit™** comfort system.
Because your day keeps going when the boots come off.



MEASURE UP™





STAYING POWER FOR DISCREET DRONES

✦ The key to fielding miniature unmanned aerial vehicles for surveillance is keeping them undetectable. That's why designers prefer to use fuel cells to power such UAVs—they are much quieter than internal combustion engines and have a minimal heat signature that cannot be detected with thermal imaging scopes. Battery power is usually too weak to keep even a small aircraft aloft very long or to match the speed of quick-moving targets. Scientists at the Naval Research Laboratory and fuel cell maker Protonex Technology have created the eXperimental Fuel Cell UAV, a small, folding-wing system designed to loiter at 30 knots and dash at 52 knots. In recent tests, the 6-foot-long XFC managed to stay aloft for more than 6 hours, powered by long-endurance hydrogen fuel cells.

NEW CAR FOR MR. MAGOO

✦ Cars could become advanced enough to be driven by people who can't see. Student researchers at Virginia Tech retrofitted a four-wheel dirt buggy to be driven by blind drivers. Test drivers controlled the vehicle using laser rangefinders as "eyes," voice controls and a tactile map, while continuing to operate the brakes and accelerator. In tests on closed courses, blind drivers outperformed sighted drivers using the same vehicles, since the sighted drivers were more hesitant to trust the car's feedback.

NEWS + TRENDS + BREAKTHROUGHS



TechWatch

✦ NEWS BRIEFS

Compiled by Alex Hutchinson



5300 Pounds of Explosive

✦ The Massive Ordnance Penetrator is designed to destroy deeply buried bunkers or hardened facilities. With a weight of 30,000 pounds (including nearly 3 tons of explosives), the precision-guided weapon would be the biggest conventional bomb the United States has ever fielded. The Air Force is asking for funds to accelerate the development of the weapon, so that MOP could be available for use by July.

30 Revolutions a Minute

Muscles atrophy in the absence of gravity, posing a sizeable problem for future astronauts on a yearlong mission to Mars. However, recent studies indicate that an hour a day on an onboard centrifuge could mitigate the problem. NASA-supported researchers at the University of Texas Medical Branch at Galveston confined 15 volunteers to zero-gravity-simulating bed rest for three weeks. Eight of them were spun 60 minutes a day in a centrifuge and maintained normal rates of protein synthesis in their thigh muscles, while rates for the bed-ridden, no-spin group dropped by almost half. Life science researchers in Galveston are seeking the right mix of food supplements, exercise and centrifuge spins to preserve astronauts' muscles—and they say that a similar formula could help elderly patients on Earth during hospital stays.



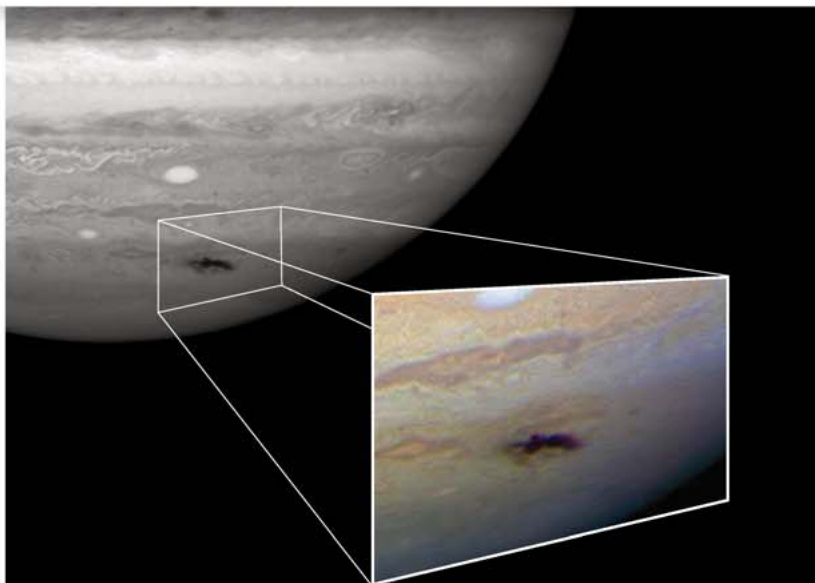


Secrets of Napoleon's Cannons

Historians have turned to violence to recreate the last moments of a 210-year-old warship that sank outside Acre in northern Israel. Archaeologists long believed it was a British vessel sunk during Napoleon's siege of the port in 1799, but wondered whether cannonballs found among the wreckage could have penetrated the ship's unusually thick oak hull. To solve the mystery, researchers from the University of Haifa this year built five 50 percent scale models of the hull, then pelted them with steel balls at speeds as slow as 200 mph and as fast as 1000 mph—a range of velocities similar to that of the cannon fire of the era. The mock cannonballs penetrated the hulls at every speed. Surprisingly, the lowest speeds were found to pose the highest risk for sailors, because the wood absorbed more energy, which created deadly, splintery shrapnel.

Cosmic Clue

AFTER SOMETHING WHACKED JUPITER, SURPRISED ASTRONOMERS TURNED INTO SLEUTHS TO FIND OUT WHAT HAPPENED. BY ANDREW MOSEMAN



➔ **Earlier this year, throngs of** professional astronomers scrambled to secure time on the world's largest telescopes after an amateur skywatcher discovered a new scar on Jupiter's surface, the result of an unexpected cosmic collision. Scientists don't like these kinds of surprises, even if the event occurred far from Earth. "We like to know where these things are, from a planetary protection standpoint," says Mark Gurwell at the Harvard-Smithsonian Center for Astrophysics. More troubling, our planetary surveillance appears to be lagging: A recent National Academy of Sciences report says that NASA's effort to catalogue dangerous near-Earth objects does not have the funding to be finished by its deadline in 2020.

Was there an impact?

➔ Leigh Fletcher's team at NASA's Jet Propulsion Lab confirmed that the spot on Jupiter was an impact site by imaging it in infrared light, which showed reflective aerosols and ammonia had been blasted high into the atmosphere. IR imagery also revealed that the spot is hotter than its surroundings.

How big was the impactor?

➔ The collision left only one scar, meaning whatever hit Jupiter didn't break up before impact. The size of the spot tells scientists that the impactor could have been a maximum of 1640 feet in diameter, too small to see from Earth.

What else does the scar indicate?

➔ Despite its small size, the July impactor created a debris field of scattered gases the size of Earth. Debris forms a substantial part of the ring seen around the impact site, but researchers are debating the direction of the impactor's approach based on the scattering of the debris plume.

What was the impactor made of?

➔ Most objects roaming the outer solar system are rock-ice balls, like comets. Astronomers are using spectroscopic analysis to examine the chemicals near the scar. Finding traces of water or oxygen would confirm that an icy body, and not a rocky asteroid, struck Jupiter.



With an underground propane tank, all you'll ever see is the comfort it brings to your home.

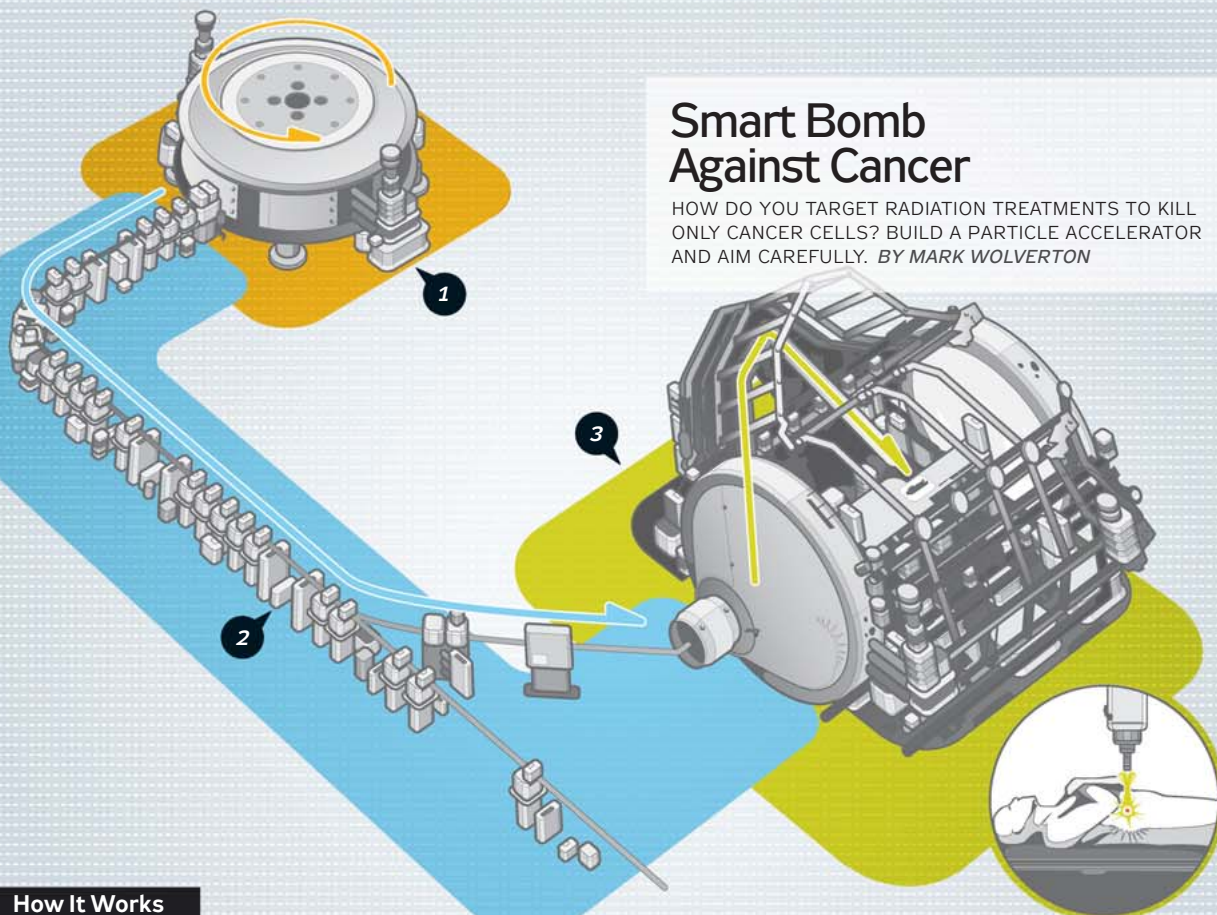
With underground propane tanks, you can get the gas appliances you really want – and curb appeal. The tanks, ranging in size from 120 to 1,000 gallons, can be installed easily underground and last for decades. The only visible sign is a small dome above ground for refilling and servicing. Propane cooktop, furnace, fireplace, and water heater inside, beautiful yard outside. See how an underground propane tank can add to the enjoyment of your home at usepropane.com.



PROPANE
EXCEPTIONAL ENERGY®

Smart Bomb Against Cancer

HOW DO YOU TARGET RADIATION TREATMENTS TO KILL ONLY CANCER CELLS? BUILD A PARTICLE ACCELERATOR AND AIM CAREFULLY. BY MARK WOLVERTON



How It Works

Step 1

CYCLOTRON

The magnet-packed particle accelerator weighs 220 tons but is only 18 feet wide and 8 feet high.

Step 2

BEAM LINE

Protons moving at almost the speed of light are deflected and focused by magnets along the

line. The beam lines are kept in a vacuum so that the particles don't slow down. The line branches out to up to five separate treatment rooms.

Step 3

GANTRIES

These 90-ton machines aim the proton beam at the patient's body; the relatively heavy

particles slow down when they encounter body tissue. When they move more slowly they interact with atoms in the body, producing ionizing

radiation. Doctors can adjust the strength of the beam to cause the protons to produce radiation only at the tumor's location.

→ Radiation treatments

for cancer are double-edged swords: They indiscriminately destroy healthy tissue along with cancer cells, causing debilitating side effects. To target cancer cells alone, the University of Pennsylvania is opening a next-generation treatment facility that uses high-energy proton beams to deliver pinpoint strikes.

Penn's \$144 million Roberts Proton Therapy Center will use magnets to

accelerate protons to near light speed in a 220-ton cyclotron. The beam lines direct the proton beams into treatment rooms where patients will have their tumors zapped. Nozzles on the ends of 90-ton gantries, aided by the CT, MRI and PET imaging equipment, aim the beams. The proton beam works like any other form of ionizing radiation, which destroys cancer cell DNA and prevents replication. "The difference is all in the physical characteristics of the beam

itself," explains James Metz, chief of clinical operations of the new facility. "A regular X-ray goes in one side of the body and out the other side and irradiates everything in between." But unlike the massless photons that compose X-rays, protons are heavy particles that enter the body without much scattering, so they can be aimed with precision. They also continue in a straight line as they slow, releasing

radioactive energy at a location determined by the beam's energy. "What that means for the patient is a much lower dose in front of the tumor and absolutely no radiation behind the tumor," Metz says.

The Roberts Center has announced partnerships with the Children's Hospital of Philadelphia, Walter Reed Army Medical Center and Bethesda's National Naval Medical Center to increase access to the expensive treatment offered by the new facility.

MTM SPECIAL OPS



BLACK SEAL

ALSO AVAILABLE IN
BRUSHED STEEL FINISH

WWW.SPECIALOPSWATCH.COM

The Special Ops line of tactical time pieces is exclusively available through Barneys New York or MTM.
Toll free at 1800 284 9487 outside of USA 213 741 0808 1225 South Grand Ave. Los Angeles, CA. 90015.

[THE SHANK]

This custom-made, diamond-encrusted bit begins as a standard half-inch raw carbide blank—the same kind companies turn into woodworking router bits.

[THE FLUTES]

Flutes channel-cut carbon fiber away from the overlap (see below). Since carbon fiber is formed in layers, the bit has to clear a lot of recently decompressed material out of the way to keep the cutting surfaces unclogged.

[THE OVERLAP]

The point where the flutes switch directions, known as the overlap, makes the cut along the carbon fiber. As the overlap cuts, the flutes of the bit push the material toward the overlap in opposing directions, and this compressed cut creates a clean edge.

[THE TIP]

Diamonds are bonded to the bit by growing them in microscopic pores on the bit's surface along the two cutting edges of each of six flutes. Unlike traditional dipped coatings, this homegrown ice has a longer life.

Bejeweled Drill Bit

Composite carbon fiber is at the foundation of some of aviation's most advanced projects, including the F-35 Lightning II airplane. The material, which is lighter and stronger than metal, requires a new class of tools to shape it. When engineers machine parts for a stealth airplane, each piece has to fit perfectly. However, the edges of carbon-composite shapes suffer from delamination when their tightly pressed layers separate after being cut. This star-shaped router bit, built by South Carolina's AMAMCO Tool, is designed to prevent delamination.

— HARRY SAWYERS



What Seeps Below

An international team of scientists has found hundreds of methane gas plumes in the depths of the Arctic Ocean.

German and English researchers used sonar to detect 250 columns of bubbles pushing out of the seabed of West Spitsbergen and then sampled the water in those areas, finding that the gas was predominantly methane. The discovery indicates there may be more of the gas being released and from deeper areas of the Arctic seabed than expected. In a recent paper in *Geophysical Research Letters*, the researchers attribute the seeps to the warming of northward-flowing currents, making this the first time increased methane leaks can be attributed to global warming. Icelike methane hydrate is trapped in the seabed, but the gas is released as the sediment thaws. The U.S. Department of Energy says there is more potential energy in methane trapped on the seafloor than in all the world's other fossil fuels combined. The majority of methane currently released from ocean seabeds is dissolved in the seawater before it reaches the atmosphere, preventing the greenhouse gas from reaching the atmosphere, but intensifying the water's acidification.



CUT YOUR HEATING AND COOLING COSTS UP TO 80% USING A CLIMATEMASTER GEOTHERMAL HEAT PUMP.

Cut your energy bills. ClimateMaster geothermal systems tap the constant temperature of the earth to provide heating, cooling, and hot water. Your home stays comfortable year-round while trimming your energy use by up to 80%. And now with new federal tax credits, you will save an additional 30% on the total installation. Best of all, ClimateMaster systems are not only a good investment, they are a cleaner choice for the environment. To learn more about how the geothermal technology leader can help you cut your energy bills, **visit climatemaster.com or call 877-436-6263 today.**


CLIMATEMASTER
Geothermal Heat Pump Systems
An LSB Industries, Inc. Company (NYSE: LXU)

Off-Road Warrior

AFTER EIGHT YEARS OF FIGHTING, TROOPS IN AFGHANISTAN ARE GETTING A VEHICLE DESIGNED FOR THE WAR. BY JOE PAPPALARDO

→ **U.S. and coalition troops in Afghanistan** load into convoys of mine-resistant, ambush-protected vehicles called MRAPs to protect themselves from improvised explosive devices. But the family of MRAPs they are riding in were produced for conditions in Iraq. In Afghanistan, roads are a rare luxury, and MRAP suspensions often break while being driven across the rocky terrain. In response, the Pentagon is now spending more than \$3 billion on 5200 MRAP all-terrain vehicles (M-ATVs) that are designed for off-road missions in Afghanistan. The Pentagon's contracts with Oshkosh Corp. specify that the company deliver all the M-ATVs by March, but the first are expected in theater next month.

The Oshkosh team started thinking of ways to adapt an existing product to compete for the contract in December 2008, shortly after the Pentagon issued an emergency call for the vehicles. The company adapted an existing 7-ton truck used by the Marine Corps by removing an axle from the chassis of the six-wheeled vehicle. (Pentagon officials are always interested in systems that share common parts, even across services, to simplify logistics.) Oshkosh's M-ATV shares other features with the 7-ton truck, including the drivetrain, dashboard and coil-spring suspension, which can clear 16 inches while the M-ATV is carrying a normal load.

The wars in Afghanistan and Iraq have ended the nearly 30-year career of the Humvee, which was created to move troops and material through safe terrain behind friendly lines. A competition to replace every service's Humvee with a better armored Joint Light Tactical Vehicle has already begun, with a showdown between the final two contenders expected in 2011.



Interior:

The seats are suspended from the ceiling with straps, instead of being bolted to the floor, so that explosive energy doesn't travel into the cab as easily. The floor-mat material—Oshkosh won't disclose what it's made of—also soaks up blast energy.

Wheels:

Located away from where people sit so that pressure-plate-triggered IEDs don't detonate under the crew.

Wheel Rims:

The rims can survive if the wheels are blasted away, at least long enough to escape the kill zone of an ambush. Drivers can change the inflation of the tires from behind the wheel for on- or off-road conditions and for load weight.

Suspension:

The specially built (and proprietary) independent coil-spring suspension can clear 16 inches with a normal load.

V-Shaped Hull:

The angled underside deflects the force of explosions away from the occupants.

Armor:

Bolt-on armor kits can be swapped out depending on the mission, and damaged vehicles can be more easily repaired on bases instead of being shipped home.

UNLOCK THE POTENTIAL OF EVERY ACRE.



Genuity™
VT Triple PRO™ Corn
Broad spectrum insect protection
and reduced refuge in the South.



At Monsanto, we're committed to helping you
get more out of every acre with revolutionary
Genuity™ trait technology.

GENUITY™. FARMING ADVANCED.™



Genuity™
Roundup Ready 2 Yield® Soybeans
Breakthrough soybean trait
technology that delivers
significantly higher yield potential.

Trait Stewardship Responsibilities Notice to Farmers

Monsanto Company is a member of Excellence Through StewardshipSM (ETS). This product has been commercialized in compliance with the ETS Product Launch Stewardship Guidance and the Monsanto Product Launch Stewardship policy, after meeting applicable regulatory requirements in key export markets with functioning regulatory systems. Any crop or material produced from this product can only be exported to, or used, processed or sold in countries where all necessary regulatory approvals have been granted. It is a violation of national and international law to move material containing biotech traits across boundaries into nations where import is not permitted. Growers should talk to their grain handler or product purchaser to confirm their buying position for this product. Excellence Through StewardshipSM is a service mark of Biotechnology Industry Organization. Cottonseed containing Monsanto traits may not be exported for the purpose of planting without a license from Monsanto.

B.t. products may not yet be registered in all states. Check with your Monsanto representative for the registration status in your state.

Roundup Ready[®]

Roundup Ready[®] crops contain genes that confer tolerance to glyphosate, the active ingredient in Roundup[®] brand agricultural herbicides. Roundup[®] brand agricultural herbicides will kill crops that are not tolerant to glyphosate.

Genuity[™] Bollgard II[®]

Growers may utilize the natural refuge option for varieties containing the Bollgard II[®] trait in the following states: AL, AR, FL, GA, KS, KY, LA, MD, MS, MO, NC, OK, SC, TN, VA, and most of Texas (excluding the Texas counties of Brewster, Crane, Crockett, Culberson, El Paso, Hudspeth, Jeff Davis, Loving, Pecos, Presidio, Reeves, Terrell, Val Verde, Ward and Winkler). The natural refuge option does not apply to Bollgard II cotton grown in areas where pink bollworm is a pest, including CA, AZ, NM, and the above listed Texas counties. It also remains the case that Bollgard[®] and Bollgard II cotton cannot be planted south of Highway 60 in Florida, and that Bollgard cotton cannot be planted in certain other counties in the Texas panhandle. Refer to the Technology Use Guide and IRM Guide for additional information regarding Bollgard II, Bollgard, natural refuge and EPA-mandated geographical restrictions on the planting of Bt cotton.

Genuity[™] SmartStax[™]

IMPORTANT: Grain Marketing and Seed Availability: Genuity[™] SmartStax[™] has received the necessary approvals in the United States, however, as of October 2009, approvals have not been received in certain major corn export markets. Genuity[™] SmartStax[™] will not be launched and seed will not be available until after import approvals are received in appropriate major corn export markets.

Genuity[™] VT Triple PRO[™]

IMPORTANT: Grain Marketing and Seed Availability: Genuity[™] VT Triple PRO[™] has received the necessary approvals in the United States, however, as of October 2009, approvals have not been received in all major corn export markets. Genuity[™] VT Triple PRO[™] seed will only be available as part of a commercial demonstration program that includes grain marketing stewardship requirements. It is a violation of national and international law to move material containing biotech traits across boundaries into nations where import is not permitted. Consult with your seed representative for current stewardship information.

ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS.

Bollgard II[®], Genuity[™], Genuity and Design[™], Farming Advanced[™], Genuity Icons, Roundup[®], Roundup Ready[®], Roundup Ready 2 Yield[®], SmartStax[™], SmartStax and Design[™], VT Triple PRO[™], YieldGard VT[®], and YieldGard VT Triple[®] are trademarks of Monsanto Technology LLC. Liberty Link and the Water Droplet Design[®] is a registered trademark of Bayer CropScience AG. Herculex is a trademark of Dow AgroSciences LLC. ©2009 Monsanto Company.

Respect the Refuge and Cotton Design[®] is a registered trademark of Monsanto Technology LLC. Respect the Refuge and Corn Design[®] is a registered trademark of National Corn Growers Association.



ADVERTISEMENT

LOVE YOUR CAR? YOU'LL LOVE "MY WHEELS"

popularmechanics.com/myWheels



You're in the driver's seat at Popular Mechanics' new online auto club. Share your enthusiasm for everything-about-cars with other car buffs.

At PopularMechanics.com/myWheels, you can:

SHOW OFF YOUR WHEELS

Share photos and videos of your car

Submit your car for the "Castrol EDGE Car of the Month"

INTERACT WITH OTHER CAR BUFFS

Swap stories, tips and more

Offer opinions, advice on the message board

EXTEND YOUR EXPERTISE

Review and rate car favorites

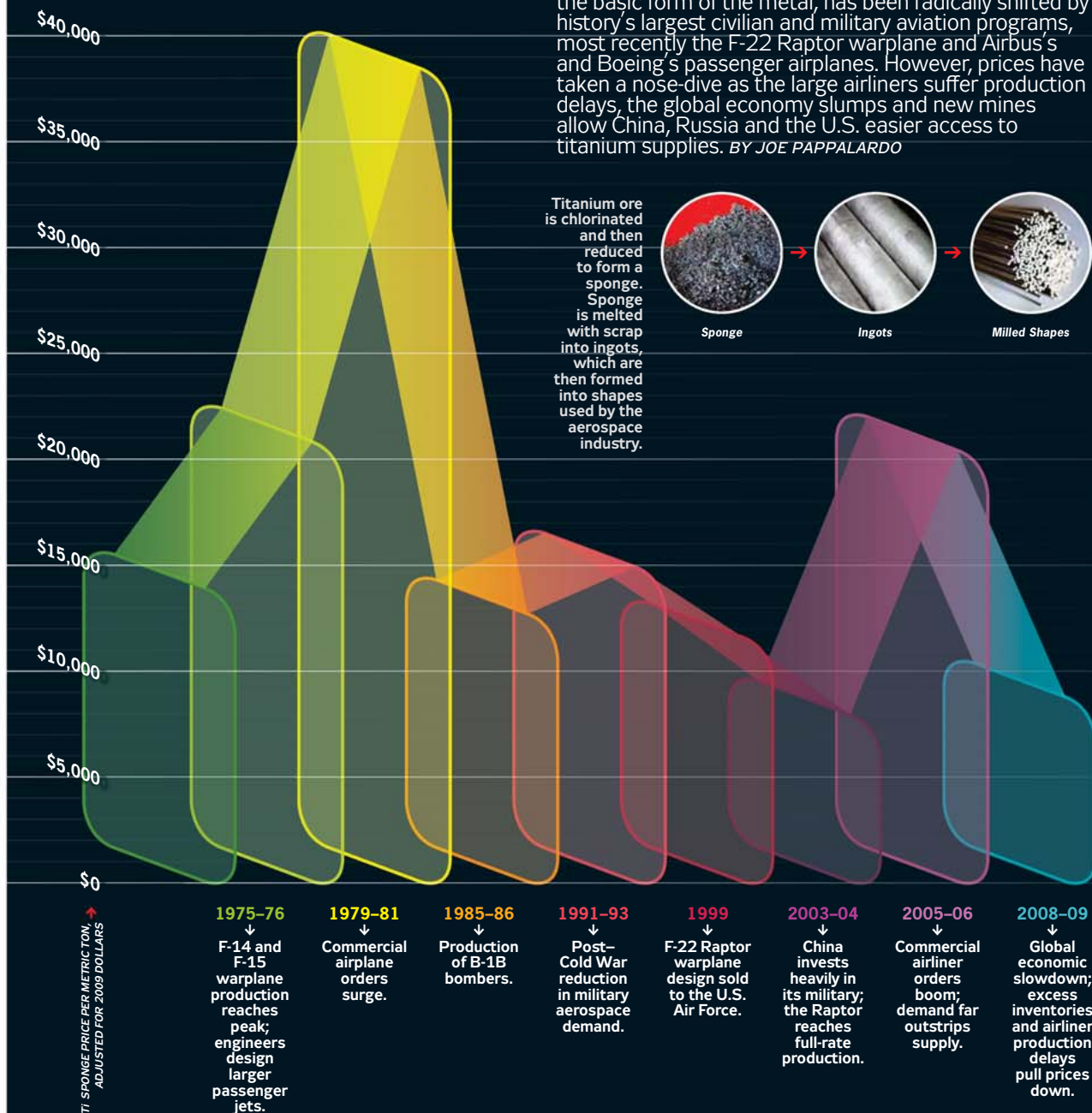
Test your auto I.Q. with a "Mechanics Quiz"

SPONSORED BY:



TITANIUM-EYE VIEW OF HISTORY

→ The prices of raw materials offer a barometer to measure the ebbs and flows of manufacturing—and, in that way, the titanium market is a mirror of the often erratic aerospace industry. The price of titanium sponge, the basic form of the metal, has been radically shifted by history's largest civilian and military aviation programs, most recently the F-22 Raptor warplane and Airbus's and Boeing's passenger airplanes. However, prices have taken a nose-dive as the large airliners suffer production delays, the global economy slumps and new mines allow China, Russia and the U.S. easier access to titanium supplies. *BY JOE PAPPALARDO*



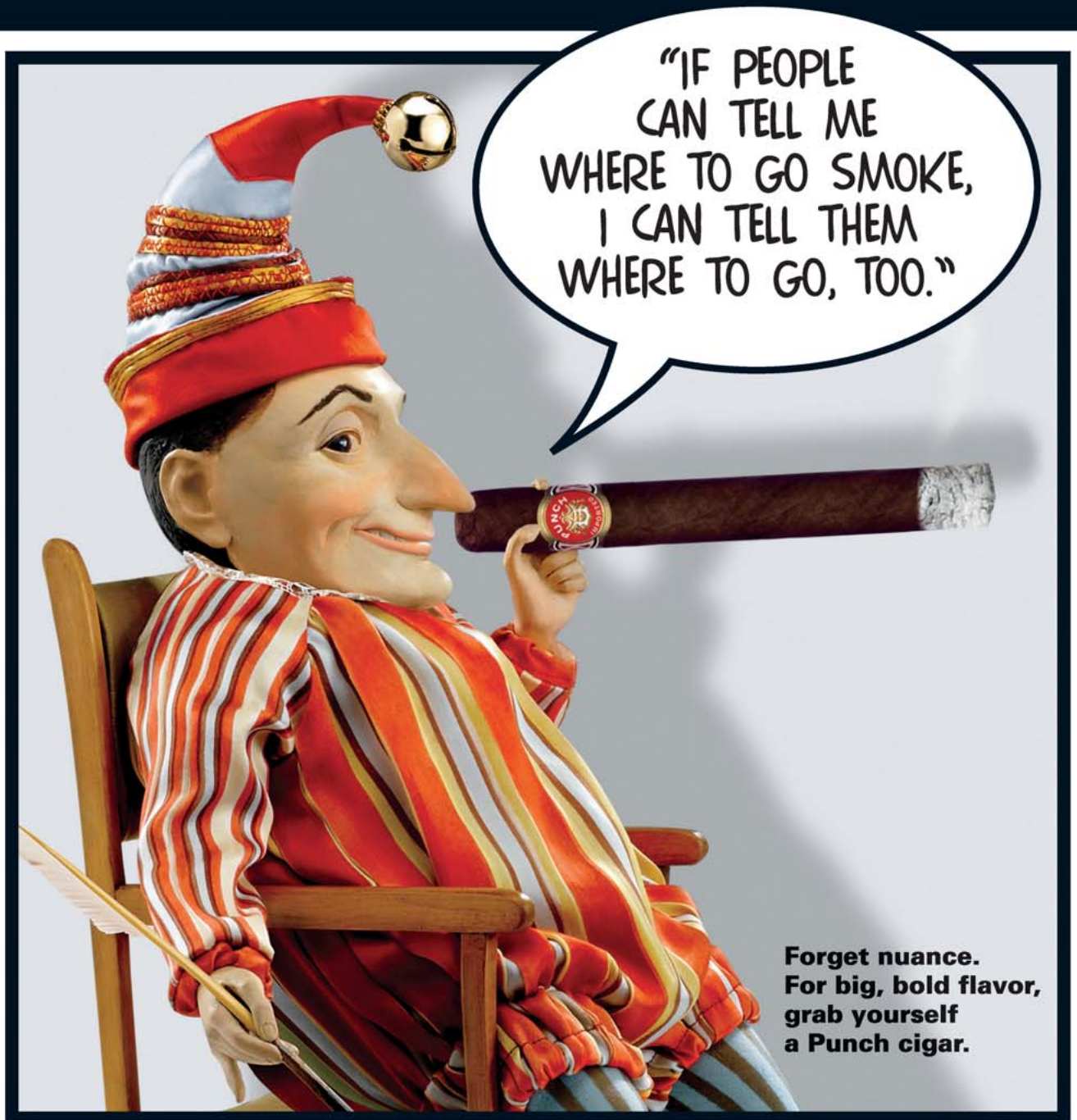
A TV THAT REALLY DELIVERS.

Whether it's dark or light on the screen; whether it's day or night in your home, the picture always looks great. And with full LED backlighting and local dimming for significantly improved contrast, everything you watch is sure to be picture-perfect.

So, is it a TV? Or something better?



Mr. Punch on Cigars...



Forget nuance.
For big, bold flavor,
grab yourself
a Punch cigar.

SURGEON GENERAL WARNING: Cigar
Smoking Can Cause Cancers Of The Mouth
And Throat, Even If You Do Not Inhale.

PUNCH[®]

True to its name.

www.cigarworld.com



Upgrade



Nano Technology

➔ Apple has a sly habit of waiting for nascent product categories to blossom, and then moving in and taking over. Up next on its hit list: Flip-style pocket camcorders. Like the new iPhone 3GS, the updated **Apple iPod Nano (\$150 for 8 GB, \$180 for 16 GB)** adds a video camera to the enormously popular player, and it does it without a price or size premium over previous models. Still, the product can be viewed as a sort of stay of execution for camcorder competitors: It doesn't shoot in hi-def, and Apple still hasn't built a video camera into its more powerful, convergence-oriented iPod Touch. But both are surely coming. — *SETH PORGES*

Future Watch

3D CAMERA



➔ 3D may be making a comeback, but there are things about it that most of us take for granted: Shooting it is strictly for big-budget directors, and we need to wear glasses to view it. The **Fujifilm FinePix Real 3D W1**, coming to Europe and Asia this fall (and to the U.S. soon after) for about \$600, does away with both of these assumptions. It's a pocket-size camera that uses two stereoscopic lenses to shoot 3D photos and videos. The product's usefulness is admittedly

limited—the 3D footage can only be seen on the camera's 2.8-inch LCD or on an 8-inch "3D viewer" accessory, both of which can display 3D *without* glasses—but it could portend a future where consumers can shoot 3D footage as easily as they shoot video with a Flip cam or an iPhone today.



Enter Your Avatar

➔ Movie-based video games are notorious for being lazy, quickly slapped-together programs designed with little ambition beyond cashing in on a movie's hype. **Avatar: The Game (\$60)** is an

exception—Ubisoft spent two full years poring over the James Cameron movie's design and aesthetics, from within the bowels of a top-secret bunker in Montreal. The coolest part: Like the movie, the Xbox

360 and PS3 versions can be played in fourth-wall-busting 3D. That is, of course, assuming you've got a 3D-capable TV (a large number of new plasma and DLP sets fit this bill).

Sound Barrier

➔ On the outside, it's hard to tell the difference between the new **Bose QuietComfort 15 (\$300)** noise-canceling headphones and the QuietComfort 2s they replace. But swap the old and new pairs while sitting next to speakers pumping 95 dB of jet-engine sounds, like we did, and you'll notice the difference. The new headphones simply do a far more effective job of quieting the ambient annoyance to an almost inaudible hum.



NEW!

Is your website ready for unlimited traffic? As the world's #1 web host, we recognize that high traffic volume

plays an essential role in the success of high performance websites. Don't restrict your website with monthly traffic allowances. At 1&1, unlimited traffic is included with all Web Hosting packages for FREE!

1&1 Web Hosting UNLIMITED

Unlimited traffic with all Web Hosting packages!

Hurry, offer ends
October 31st!

PERSONAL HOSTING

Everything you need for
a perfect site.

1&1® Home Package:

- 2 FREE Domains
- 150 GB Web Space
- **UNLIMITED** Traffic

**50%
off!**

First 6 months

~~\$6.99~~
per month

\$3.49
per month*

Hurry, offer ends
October 31st!

BUSINESS HOSTING

Powerful solution for
professional websites.

1&1® Business Package:

- 3 FREE Domains
- 250 GB Web Space
- **UNLIMITED** Traffic

**50%
off!**

First 6 months

~~\$9.99~~
per month

\$4.99
per month*

Special Offer: .net and .info domains just \$4.49 for the first year!*

More special offers are available online. For details, visit www.1and1.com



*Offers valid through October 31, 2009. Setup fee, minimum contract term, and other terms and conditions may apply. Visit www.1and1.com for full promotional offer details. Program and pricing specifications, availability and prices subject to change without notice. 1&1 and the 1&1 logo are trademarks of 1&1 Internet AG, all other trademarks are the property of their respective owners. © 2009 1&1 Internet, Inc. All rights reserved.



Call **1-877-GO-1AND1**
Visit us now **www.1and1.com**



Abusive Lab Test

LOCKING PLIERS

the locking pliers



Petersen Vise-Grip
10-inch straight
(\$9 on eBay)



Irwin Vise-Grip
10-inch straight
(\$11)



Buyer's Value
10-inch straight
(\$7)

→ The iconic Vise-Grip locking pliers quite literally aren't what they used to be—in 2008, six years after purchasing the brand from Petersen Manufacturing, Irwin Tools' parent company Newell Rubbermaid shuttered the Nebraska Vise-Grip factory and moved production to China. So we wondered: How do the new outsourced Vise-Grips hold up to the Nebraska classics (which are no longer stocked in stores, but are sure to be found in lots of toolboxes). We put both, along with a pair of discount Buyer's Value brand locking pliers, to the test. *BY HARRY SAWYERS*



CLAMP FORCE

How many pinches does it take to completely crush 1/2-inch copper tubing?

+

PETERSEN VISE-GRIP: After 12 squeezes, the pipe collapsed, and our fatigued testers nearly did the same. Operating the tool repeatedly proved so challenging that it became hard to muster enough hand strength just to release the trigger.

IRWIN VISE-GRIP: Like the Petersen Vise-Grips, the Irwin also took 12 squeezes to pinch the pipe shut. But thanks to the cushioned grip, it felt like less.

BUYER'S VALUE: Crushing the copper took 21 squeezes. The tool just didn't do as good a job as the others at translating our hand movements into jaw force.

WINNER: Irwin Vise-Grip

GRIP STRENGTH

Which pliers can stay clamped during a 6-foot drop? We gave our contestants 10 tries.

+

PETERSEN VISE-GRIP: With a grip like a pit bull, this was the only pair to stay locked shut after all 10 drops.

IRWIN VISE-GRIP: On eight of 10 drops, the trigger-free quick release popped open.

BUYER'S VALUE: Despite a fragile-feeling frame that suggested each fall might be the last, the pliers stayed shut through eight of the drops.

WINNER: Petersen Vise-Grip

the tests

↙

ERGONOMICS

How do our testers' hands hold up to the strain of squeezing for hours on end?

+

PETERSEN VISE-GRIP: Ouch. Slick, skinny metal hurt our palms, and pliers-shaped bruises appeared on our thighs after bracing the tools against our legs during doubled-over squeezing.

IRWIN VISE-GRIP: The cushioned grips added considerable comfort. These clamped with as much force as the Petersen classics, but took much less effort.

BUYER'S VALUE: Squeezing didn't hurt our hands too much, but the cheap-feeling jaws didn't transfer much force, either.

WINNER: Irwin Vise-Grip

BOTTOM LINE

The Irwin update wins when it comes to comfort—the cushioned handle was easy on our hands. But when you need tenacious gripping strength, nothing beats the original Petersen Vise-Grips.

TAKE IT OR LEAVE IT.

FREEDOM TO TAKE YOUR TOOLS WITH YOU,
AND THE SECURITY TO LEAVE THEM BEHIND.

STANLEY
GUARD
SECURITY ALARM SYSTEM



KEYPAD ALARM ALLOWS ACCESS
WITH PERSONALIZED CODE



LOCKS INTO EASY-TO-MOUNT DOCKING
STATION & FITS ANY TRUCK BED



WATER SEAL KEEPS THE ELEMENTS OUT
& VERTICAL STORAGE ORGANIZES TOOLS



8.5" WHEELS PROVIDE MAXIMUM
PORTABILITY FOR TOUGH TERRAIN

The Best of Both Worlds for Truck Owners: Extreme Security & Versatility

The Stanley® Portable Truck Box can undock from your truck bed in seconds to make room for lumber or other materials. Day or night, an innovative keypad alarm system stands ready to alert you if someone is tampering with it. An integrated water seal also protects your tools from the elements.

Visit a Lowe's near you to see the innovation behind the The Stanley® Portable Truck Box.

Available only at:



STANLEY

stanleytools.com

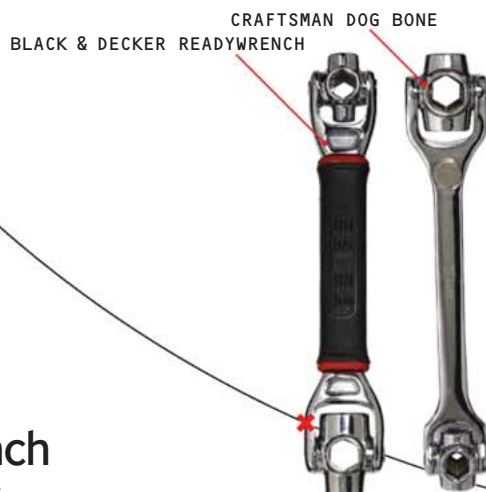


Flipping Birds

→ Turkey-frying devotees swear there's no better way to cook up a bird, but the flammable oil displaced by a 15-pound turkey can easily overflow onto a propane-

fueled flame; the resulting flare-ups have left numerous homes and decks in ruins. Unlike other fryers, the countertop-friendly **Master-built Butterball**

Indoor Electric Turkey Fryer (\$120) is safe enough to be used indoors. It subs out propane for a wall plug and features a sensor that prevents overheating.



Wrench Wars

→ The hand-tool market is so competitive that any good idea is bound to breed copycats. Take the new **Craftsman Dog Bone (\$20)** and **Black & Decker ReadyWrench (\$30)** socket wrenches. Both tools feature essentially the same design—a steel shaft topped at both ends by a rotating quiver of eight different sockets. The differences between the two tools are minute: The B&D has cushioned grips and clearer markings, while the Craftsman has a magnet to hold loose nuts. So how did the dueling doppelgängers make their simultaneous debut? Black & Decker claims to have developed the tool in-house, insinuating that a rogue ex-employee or loose-lipped tool buyer spilled the beans. Craftsman acknowledges the proposal came to them from an outside toolmaker. But the truth is that neither company's idea is original—the first Dog Bone, a dead ringer for the new one, was a Craftsman tool from 40 years ago. It's a clever design. But then, as now, we would've preferred slender, ratcheting sockets.

Surface Sounds

→ Stick the battery-powered **Kerchoonz K-Box Speaker (\$75)** to any flat surface and it uses the material's natural sound-conducting properties for amplification. The real fun is the sense

of discovery that comes from seeing what sort of sounds different materials produce. (Spoiler alert: Glass and metal sound the best, wood sounds like it's rattling, and particleboard just sounds tinny.)



Day Pass

→ 24 hours. A full day. That's how long you can shoot high-definition video with the **Canon Vixia HF S11 (\$1400)** before having to unload footage from the 64 GB of built-in flash memory—even longer if you take advantage of its SD memory-card slot. Practically speaking, most of us can take this thing on vacation without ever having to worry about running out of recording room.





He's a
tough guy.
But he
cleans
up after
himself.



Auto-Focus, Frame and Shot

→ Japanese companies are known for coming up with kooky robotic toys for their own nation's consumption. Occasionally, these gadgets make it to America. Such is the case with the *Sony Party-shot* (\$150). Pop a compatible camera (it works with only two models for now) into this robotic dock during a shindig, and it pans and

tilts around the room while snapping photos at regular intervals. Just remember to move it around—it's a bit odd having an entire party's worth of shots from the same fixed point.



No Residue Duct Tape
ScotchToughTape.com



©2009 3M, Scotch, the Scotch Tough Duct Tape Design and the Plaid Design are trademarks of 3M.

**NOW CAMPBELL'S® CHUNKY™
HAS 34 SOUPS THAT ARE A**

GOOD
SOURCE* OF
PROTEIN



BETTER THAN EVER

*Provides 10% of recommended daily value of protein per serving.

©2009 CSC BRANDS LP

CROSSOVER + SPORT COUPE
ROADSTER + SEDAN



New Cars

Rising Star

++
PM TEST
DRIVEN

The new LaCrosse is evidence that Buick is bouncing back—as soon as we pressed the throttle, this car impressed. The 255-hp 3.0-liter V6 (a 3.6-liter V6 is optional, as is a four-cylinder that returns 30 mpg highway) smoothly hummed as it revved. But you hear just a hint of growl, which makes exercising this engine rewarding. In manual mode, the engine will bounce off the 7000-rpm rev limiter—not automatically upshift like some luxury cars. Part of the credit for the powertrain's refinement is the solid structure it's bolted to. There's a higher percentage of high-strength steel here than on any other GM product. Road impacts are barely audible, with none of the heaves and bobs that used to plague Buicks. Inside, the materials are one big notch above the usual GM decor, with a huge rear seat and a comfortable backrest. The best Buick in decades? Could be. —LARRY WEBSTER

inside

2010
buick lacrosse
Base Price: \$27,085

Subaru Outback
Nissan 370Z Roadster
Cadillac SRX 2.8T
Chevy Cruze
Kia Forte Koup
Lotus Elise SC
BMW X6 M
Fiat 500C



first look
trends



2010
Nissan 370Z Roadster2010
Subaru Outback

Trail Blazer

The 1995 Subaru Outback was arguably the world's first crossover. And Subaru carries those rugged traditions forward to the new Outback. The redesigned Subaru is larger, and provides 4 more inches of rear legroom than before—a substantial gain. The base 170-hp 2.5-liter flat Four is paired to a six-speed manual or a CVT. Step up to the 3.6-liter flat Six and 256 hp flows through a five-speed automatic. Of course, opting for the Six brings more thrust. But the gain in performance doesn't seem to be worth the expense, considering how brilliantly the Four works with the CVT. As with all Subaru, all-wheel drive is standard, and the Outback is a solid scrambler along dirt roads and up some pretty difficult trails. It's no Jeep Wrangler, but when you absolutely, positively must get to the ski mountain, this \$22,995 Subaru is more than capable. — JOHN PEARLEY HUFFMAN

Structural Integrity

Early on, Nissan made a crucial decision to design the 370Z Roadster at the same time as the Coupe. As a result, many of the car's structural members are modular, able to accept either a lighter part for the Coupe or a stronger subassembly for the Roadster. That means this convertible is 150 pounds lighter and much stiffer than the last Z Roadster. Even with our \$40,490 Z's Sport package (which adds 19-inch wheels, a viscous limited-slip and better brakes), the structure felt commendably tight. Nissan aimed to match the Porsche Boxster's degree of cabin comfort with the top down—the result is a placid environment. As speeds increase out in the wild, the Z acquires a fluid poise. The V6 spins to 7500 rpm before driving its tach needle into the red zone, and that provides long stretches of thrust in every gear. The interior is lined with soft-touch moldings, suede textures and exclusive seats. Speed and comfort? Sold. — BARRY WINFIELD

Now almost 30 pounds lighter, the cloth soft-top is stretched over an articulating frame that raises and stows itself tidily in around 20 seconds. The mechanism is now hydraulic, with a double-jointed linkage that helps stow the stack in a surprisingly small bay under the newly sculpted hard tonneau panel.



BUICK LACROSSE | SUBARU OUTBACK | SAAB 9-5
NISSAN 370Z ROADSTER | CADILLAC SRX 2.8T
CHEVY CRUZE | KIA FORTE | KIA NIO
LOTUS ELISE SC | BMW X6 M | FIAT 500C (CONVERTIBLE)

BRETT FAVRE
AT HOME IN WRANGLER RELAXED FIT

Just Love It

Wrangler



FIVE STAR
Premium Denim



YOU CAN COUNT ON WRANGLER.
COMFORT. QUALITY. VALUE.

AVAILABLE AT



Wrangler

Real. Comfortable. Jeans.

2010
Chevy Cruze2010
Cadillac SRX 2.8T2010
Kia Forte Koup

COURSE CORRECTION Cadillac's direct-injected 3.0-liter V6 is a modern, smooth and efficient engine with a class-competitive 265 hp good enough for many but with less oomph than some luxury crossovers. Bring on the new turbo option. Though the smallest engine in the Cadillac range, the 2.8-liter V6's turbo provides 300 hp and, crucially, 295 lb-ft of torque at a mere 2000 rpm. We sampled the SRX 2.8T on the road course at GM's Milford Proving Ground and on nearby public roads. We drove it back-to-back with the 3.0-liter model at the track, and the difference is noticeable—the turbo really hauls. Expect to pay for that power, though; fully loaded SRX models will touch \$55,000.

— KEVIN A. WILSON

Talent Scout

GM has launched its Cobalt replacement, the new Cruze midsize sedan, in Europe first. The U.S. Cruze arrives next year, alongside its platform mate, the Volt. So we decided to slide behind the wheel in England to get an early taste. Near GM's test track in Ampthill, we drove the Cruze on a horrible collection of broken surfaces, and it handled well. The Cruze is powered by a 1.8-liter gasoline four-cylinder or a diesel. The 1.8-liter Cruze weighs 2882 pounds, and it rides and points into corners with more alacrity than the heavier diesel. Chevy won't offer the diesel in the U.S., but we will receive a 1.4-liter turbo-charged Four that is said to deliver around 40 mpg highway. Inside, the fit and finish indicate a notch above the class. The seat stitching is perfect, and the four-dial instrument binnacle is easy to read. If it weren't for the noisy ride and rather inert steering, the Cruze could take a bite out of more expensive rivals. But we'll wait for a U.S.-spec drive for our final judgment. — ANDREW ENGLISH

Civic Duty

The \$15,000 Koup is a slick spinoff of Kia's Forte sedan, with a lean, purposeful look that says the company is serious about sportiness. The EX has a 156-hp 2.0-liter four-cylinder, but the SX is equipped with a 173-hp 2.4-liter and delivers 32 mpg highway. The Koup's suspension uses a thicker sway bar, tighter steering ratio and stiffer shocks than the sedan, while the SX version has slightly more aggressive tuning. So the Koup corners like a real sport compact. The ride is comfortable, but pothole jolts are fairly severe. The 2.4-liter makes the Koup feel lively—especially at higher rpm. And 70 mph translates to a mere 2200 rpm, so real-world economy should be excellent. Kia is new to the sport coupe scene, yet here it has built a cool, competent Civic Coupe competitor for less dough. Kudos to Kia. — BASEM WASEF



BUICK LACROSSE | SUBARU OUTBACK
NISSAN 370Z | HONDA CROSSTOUR
CHEVY CRUZE | KIA FORTE KOU
LOTUS ELISE SC | BMW X6 M | FIAT 500C (CONVERTIBLE)



You'll never forget that day.
PLAVIX can help keep you from going through it again.

PLAVIX can help save lives for those who've had a heart attack caused by a completely blocked artery.

Without PLAVIX



Clots that block off arteries are the main cause of heart attack. And now that you've had a heart attack you are at a greater risk of having another that can be fatal. That's why your doctor may put you on PLAVIX, along with your

other heart medicines. Taking PLAVIX with your other heart medicines goes beyond what other heart medicines alone can do to keep blood platelets from sticking together and forming dangerous clots.

With PLAVIX



Important Safety Information: If you have a stomach ulcer or other condition that causes bleeding you should not use PLAVIX. Taking PLAVIX alone or with some other medicines including aspirin may increase bleeding risk. Tell your doctor before planning surgery or taking aspirin or other medicines with PLAVIX, especially if you've had a stroke. Some medicines that are used to treat heartburn or stomach ulcers, like Prilosec, may affect how PLAVIX works, so tell your doctor if you are taking other medicines. If fever, unexplained weakness or confusion develops, tell your doctor promptly. These may be signs of TTP, a rare but potentially life-threatening condition, reported sometimes less than 2 weeks after starting PLAVIX. Other rare but serious side effects may occur.

Ask your doctor how PLAVIX can help increase your protection against future heart attack, stroke, and even death.

To learn more about heart attacks and PLAVIX, visit www.plavix.com or call 1-877-920-1462.

You are encouraged to report negative side effects of prescription drugs to the FDA. Visit www.fda.gov/medwatch, or call 1-800-FDA-1088.

See important product information on the following page.

If you need help paying for prescription medicines, you may be eligible for assistance. Call 1-888-4PPA-NOW (1-888-477-2669), or go to www.pparx.org



Partnership for
Prescription Assistance

ONCE-A-DAY

Plavix
(clopidogrel bisulfate) 75mg tablets

Protection that helps save lives.

PLAVIX

(clopidogrel bisulfate) tablet, film coated

Rx Only

WHO IS PLAVIX FOR?

PLAVIX is a prescription-only medicine that helps keep blood platelets from sticking together and forming clots.

PLAVIX is for patients who have:

- had a recent heart attack.
- had a recent stroke.
- poor circulation in their legs (Peripheral Artery Disease).

PLAVIX in combination with aspirin is for patients hospitalized with:

- heart-related chest pain (unstable angina).
- heart attack.

Doctors may refer to these conditions as ACS (Acute Coronary Syndrome).

Clots can become dangerous when they form inside your arteries. These clots form when blood platelets stick together, forming a blockage within your arteries, restricting blood flow to your heart or brain, causing a heart attack or stroke.

WHO SHOULD NOT TAKE PLAVIX?

You should NOT take PLAVIX if you:

- are allergic to clopidogrel (the active ingredient in PLAVIX).
- have a stomach ulcer
- have another condition that causes bleeding.
- are pregnant or may become pregnant.
- are breast feeding.

WHAT SHOULD I TELL MY DOCTOR BEFORE TAKING PLAVIX?

Before taking PLAVIX, tell your doctor if you're pregnant or are breast feeding or have any of the following:

- gastrointestinal ulcer
- stomach ulcer(s)
- liver problems
- kidney problems
- a history of bleeding conditions

WHAT IMPORTANT INFORMATION SHOULD I KNOW ABOUT PLAVIX?

TTP: A very serious blood condition called TTP (Thrombotic Thrombocytopenic Purpura) has been rarely reported in people taking PLAVIX. TTP is a potentially life-threatening condition that involves low blood platelet and red blood cell levels, and requires urgent referral to a specialist for prompt treatment once a diagnosis is suspected. Warning signs of TTP may include fever, unexplained confusion or weakness (due to a low blood count, what doctors call anemia). To make an accurate diagnosis, your doctor will need to order blood tests. TTP has been reported rarely, sometimes in less than 2 weeks after starting therapy.

Gastrointestinal Bleeding: There is a potential risk of gastrointestinal (stomach and intestine) bleeding when taking PLAVIX. PLAVIX should be used with caution in patients who have lesions that may bleed (such as ulcers), along with patients who take drugs that cause such lesions.

Bleeding: You may bleed more easily and it may take you longer than usual to stop bleeding when you take PLAVIX alone or in combination with aspirin. Report any unusual bleeding to your doctor.

Geriatrics: When taking aspirin with PLAVIX the risk of serious bleeding increases with age in patients 65 and over.

Stroke Patients: If you have had a recent TIA (also known as a mini-stroke) or stroke taking aspirin with PLAVIX has not been shown to be more effective than taking PLAVIX alone, but taking aspirin with PLAVIX has been shown to increase the risk of bleeding compared to taking PLAVIX alone.

Surgery: Inform doctors and dentists well in advance of any surgery that you are taking PLAVIX so they can help you decide whether or not to discontinue your PLAVIX treatment prior to surgery.

Genetics: People with a specific genetic makeup may get less protection against future cardiovascular events, such as a heart attack or stroke, with Plavix.

WHAT SHOULD I KNOW ABOUT TAKING OTHER MEDICINES WITH PLAVIX?

You should only take aspirin with PLAVIX when directed to do so by your doctor. Certain other medicines should not be taken with PLAVIX. Be sure to tell your doctor about all of your current medications, especially if you are taking the following:

- aspirin
- nonsteroidal anti-inflammatory drugs (NSAIDs)
- warfarin
- heparin
- heartburn or stomach ulcer medicines, like Prilosec

Be sure to tell your doctor if you are taking PLAVIX before starting any new medication.

WHAT ARE THE COMMON SIDE EFFECTS OF PLAVIX?

The most common side effects of PLAVIX include gastrointestinal events (bleeding, abdominal pain, indigestion, diarrhea, and nausea) and rash. This is not a complete list of side effects associated with PLAVIX. Ask your doctor or pharmacist for a complete list.

HOW SHOULD I TAKE PLAVIX?

Only take PLAVIX exactly as prescribed by your doctor. Do not change your dose or stop taking PLAVIX without talking to your doctor first.

PLAVIX should be taken around the same time every day, and it can be taken with or without food. If you miss a day, do not double up on your medication. Just continue your usual dose. If you have any questions about taking your medications, please consult your doctor.

OVERDOSAGE

As with any prescription medicine, it is possible to overdose on PLAVIX. If you think you may have overdosed, immediately call your doctor or Poison Control Center, or go to the nearest emergency room.

FOR MORE INFORMATION

For more information on PLAVIX, call 1-800-633-1610 or visit www.PLAVIX.com. Neither of these resources, nor the information contained here, can take the place of talking to your doctor. Only your doctor knows the specifics of your condition and how PLAVIX fits into your overall therapy. It is therefore important to maintain an ongoing dialogue with your doctor concerning your condition and your treatment.

Distributed by:

Bristol-Myers Squibb/Sanofi Pharmaceuticals Partnership
Bridgewater, NJ 08807

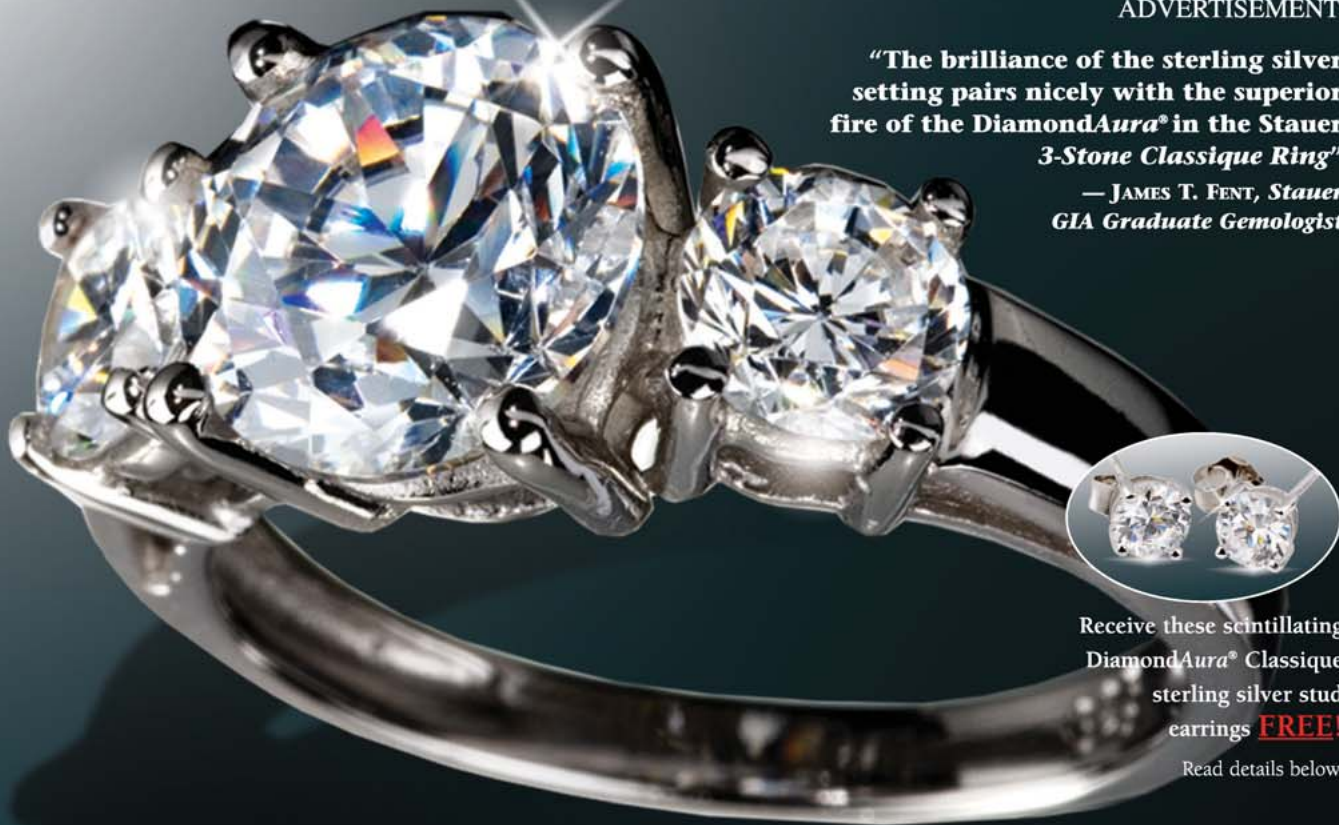
PLAVIX® is a registered trademark.

CLO-BSCW-SAW-JUL09

Revised: July 2009

"The brilliance of the sterling silver setting pairs nicely with the superior fire of the DiamondAura® in the Stauer 3-Stone Classique Ring"

— JAMES T. FENT, *Stauer*
GIA Graduate Gemologist



Receive these scintillating DiamondAura® Classique sterling silver stud earrings **FREE!**

Read details below.

The Fifth C?

Cut, Color, Carat, Clarity...Chemistry?

Is it possible that the mind of a scientist can create more beauty and romance than Mother Nature? The laboratories at DiamondAura® were created with one mission in mind: *Create brilliant cut jewelry that allows everyone to experience more clarity, more scintillation and larger carat weights than they have ever experienced.* So, we've taken 2 ½ carats of our lab-created DiamondAura® and set them in the most classic setting—the result is our most stunning, fiery, faceted design yet! In purely scientific measurement terms, the refractory index of the DiamondAura is very high, and the color dispersion is **actually superior** to mined diamonds.

Perfection from the laboratory. We named our brilliant cut stones DiamondAura, because, "they dazzle just like natural diamonds but without the outrageous cost." We will not bore you with the incredible details of the scientific

COMPARE FOR YOURSELF AT 2 ½ CARATS		
	Mined Flawless Diamond	DiamondAura® Compares to:
Hardness	Cuts Glass	Cuts Glass
Cut (58 facets)	Brilliant	Brilliant
Color	"D" Colorless	"D" Colorless
Clarity	"IF"	Clear
Dispersion/Fire	0.044	0.066
2 ½ c.t.w. ring	\$60,000+	\$145

process, but will only say that it involves the use of rare minerals heated to an incredibly high temperature of nearly 5000°F. This can only be accomplished inside some very modern and expensive laboratory equipment. After several additional steps, scientists finally created a clear marvel that looks even better than the vast majority of mined diamonds. According to the book *Jewelry and Gems—the Buying Guide*, the technique used in DiamondAura offers, "The best diamond simulation to date, and even some jewelers have mistaken these stones for mined diamonds."

The 4 C's. Our DiamondAura 3-Stone Classique Ring retains every jeweler's specification: color, clarity, cut, and carat weight. The transparent color and clarity of DiamondAura emulate the most perfect diamonds—D Flawless, and both are so hard they will cut glass.

The brilliant cut maximizes the fire and radiance of the stone so that the light disperses into an exquisite rainbow of colors.

Rock solid guarantee. This .925 sterling silver ring is prong-set with a 1 ½ carat DiamondAura round brilliant in the center, showcased between two DiamondAura round brilliants of ½ carats each. Adding to your 4 C's, we will include the DiamondAura stud earrings for FREE! Try the DiamondAura 3-Stone Classique Ring for 30 days. If for any reason you are not satisfied with your purchase, simply return it to us for a full refund of the purchase price and keep the stud earrings as our gift.

Not Available in Stores

DiamondAura® 3-Stone Classique Ring

(2 ½ c.t.w.) • \$145 + S&H

FREE stud earrings with purchase of Classique Ring—a \$59.95 value!

Available in ring sizes 5-10

Call to order toll-free, 24 hours a day, 7 days a week.

1-888-201-7095

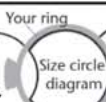
Promotional Code DAR626-02

Please mention this code when you call.

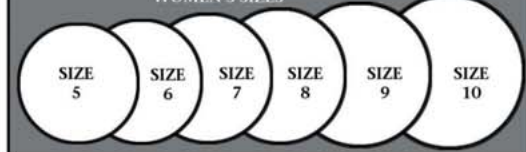
Stauer
HERITAGE OF ART & SCIENCE

14101 Southcross Drive W.,
Dept. DAR626-02,
Burnsville, Minnesota 55337
www.stauer.com

Place one of your own rings on top of one of the circle diagrams. Your ring size is the circle that matches the inside diameter of your ring. If your ring falls between sizes, order the next larger size.



WOMEN'S SIZES



2010
Lotus Elise SC2
2010
BMW X6 M2010
Fiat 500C (Convertible)

Sensible Speed

Piloting a \$61,900 Lotus Elise SC the way it was intended to be driven—that is, maximizing the Lilliputian roadster's natural-born nimbleness by dancing around corners and sweeping the tachometer up to 8500 rpm—is fun. But could this peppy plaything have a sensible side too? We decided to stretch every ounce of fuel from the car's 10.6-gallon tank that we could, maximizing mileage. We accumulated 500 miles of mild-mannered driving and short-shifting, avoiding the fuel-sucking tendencies of the supercharger, with surprisingly efficient results. Sixty mph translates to 2750 rpm, making the Elise SC feel perfectly content trundling along on the highway. On one long-distance run from Los Angeles to La Jolla, we coaxed 31.7 mpg from the Lotus—our best results of the test. The golden age of horsepower may be waning, but cars like the Lotus Elise prove there's no reason speed and efficiency can't happily coexist.

—BASEM WASEF

Track Worthy

BMW's storied M division has stepped up to what is, quite literally, its biggest challenge ever: creating a high-performance 5324-pound X6. Rest assured, the 555-hp V8, sublime suspension and massive tires do their best to make the \$89,725 X6 M perform. Given a little space in traffic, or the need to pass, the stout engine pushes you way back into the seat. There's also a deep exhaust note, appreciably crisper when the driver selects Sport mode. Cut it loose on the sweeping turns, hilly terrain and long straights of the track at Road Atlanta, though, and the X6 M responds like the hot machine it is. On the long series of open curves and the straight coming down the hill, we saw an indicated 135 mph before needing to brake hard for the ensuing left-hand, 90-degree turn. Whew, this is one quick truck. —K.W.

SUMMER FLING

The Fiat 500 minicar will likely be the first "Italian job" Chrysler offers in the U.S. for 2011. But it would be difficult to imagine this charming convertible version failing to make the cut too. The 500C's top is electrically powered and can be partially retracted as a small sunroof, rolled further back as a full-length sunroof or furled down on top of the trunk in complete alfresco mode. The cabin is impressively calm with the roof down. The 1.4-liter model is brisker than a stopwatch might indicate. And there's enough torque to ensure you don't have to row the car along with the gear lever. This 37-mpg funster is so lovable that it's hard to wipe the smile off your face. —A.E.



BUICK LACROSSE | SUBARU OUTBACK
HYUNDAI ELANTRA | CADILLAC SRX 2.8T
NISSAN CRUZE | KIA NIRO
LOTUS ELISE SC | BMW X6 M | FIAT 500C (CONVERTIBLE)



WHEN YOUR ENGINE'S RUNNING CLEAN,
YOU FEEL IT.



CLEAN OUT UP TO 15% OF SLUDGE IN THE 1ST CHANGE.* Nothing feels better than a clean-running engine. But over time, sludgy deposits can rob you of that clean feeling. So choose an oil that's packed



with active cleansing agents that not only help prevent sludge, they clean out up to 15% of sludge in your first oil change. Time for an oil change? Change with Pennzoil® and Feel The Clean. Learn more at Pennzoil.com. **Not just oil, Pennzoil.®**



2010
HARLEY-DAVIDSON
FAT BOY LO

The new **Fat Boy Lo** bears a heavier, low-slung stance consistent with its moniker. This model has the shortest seat height (24.25 inches) of any Harley-Davidson, thanks to a suspension that's been dropped 1.15 inches. Available only in glossy or matte black, the Fat Boy Lo's appearance is mean, but riders will find its predictable acceleration and accommodating ergonomics welcoming. —BASEM WASEF

2010
SUZUKI
KIZASHI

The **Kizashi** is intended to bring European dynamics to a segment bristling with competent rivals—including the Honda Accord and Toyota Camry. The sedan will arrive with either a 2.4-liter four-cylinder or a 3.2-liter V6 and has optional all-wheel drive. High-speed calibrations were dialed in at the Nürburgring track—so this \$19,000 sedan could be Suzuki's best ever.

—BARRY WINFIELD

2011
INFINITI
M56

The sleek new midsize **M** (a BMW 5 Series and Mercedes-Benz E-Class fighter) will ride on a lengthened and widened version of the current G platform. But the real news is that the top M56 model (which replaces the M45) will have a new 5.6-liter V8 under the hood, generating more than 400 hp. And though the new M has a more powerful engine lineup, Infiniti says fuel consumption is reduced.

—BEN STEWART

2010
VICTORY
CROSS COUNTRY

The touring-oriented **Cross Country** (\$17,999) is powered by the same V-twin found in the Vision. It has a low 26.2-inch seat height and is clad with a large fork-mounted fairing with full instrumentation. MP3 devices can be stowed in the right saddlebag and played through the audio system. A tall accessory windshield and lower wind deflectors are available for added insulation.

—BASEM WASEF





THIS IS AN ALLSTATE AGENT

Myles Harris
Stockton, CA

WANT TO SAVE UP TO 40% ON MOTORCYCLE INSURANCE?

Allstate has over 600 agents who ride. So they know bikes. And they know how to help you save money insuring one—**You can save up to 40%.** Plus Allstate has more motorcycle discounts than most other companies.

You deserve an agent who speaks your language. That's Allstate's Stand.

TALK TO AN ALLSTATE AGENT TODAY | 877-361-BIKE | allstategarage.com



Allstate

**MOTORCYCLE
INSURANCE**

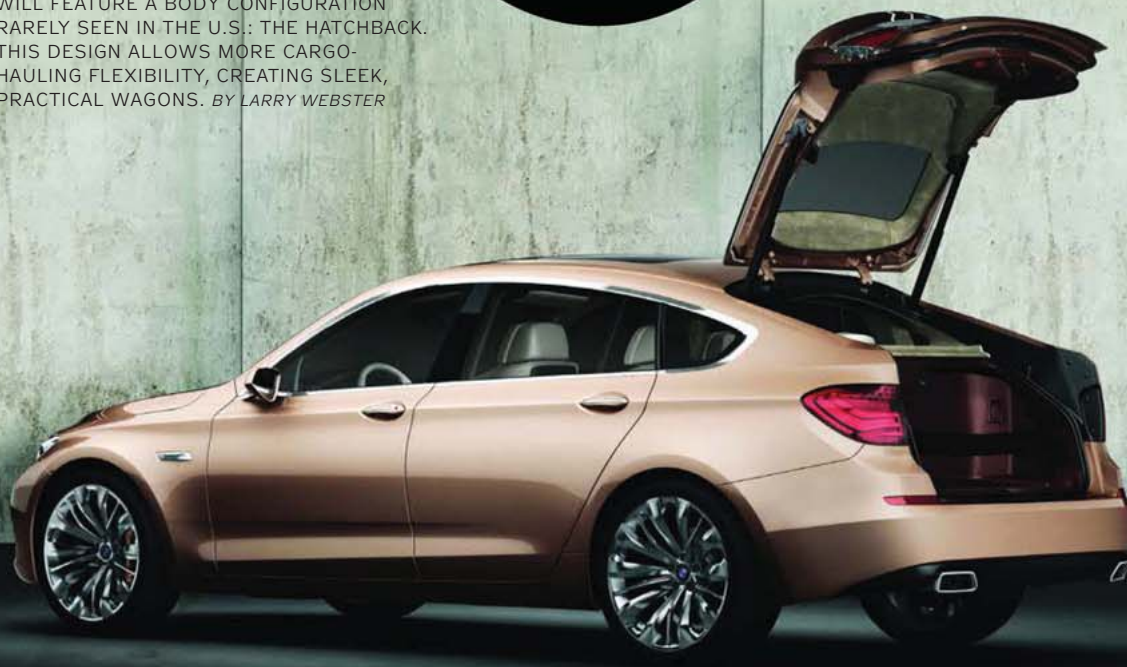
Insurance and discounts subject to terms, qualifications and availability. Discount amount may vary. Property-casualty insurance products issued by Allstate Fire and Casualty Insurance Company, Allstate Indemnity Company, Allstate Insurance Company, Allstate Property and Casualty Insurance Company, Northbrook, IL and Allstate New Jersey Property and Casualty Insurance Company, Bridgewater, NJ. © 2009 Allstate Insurance Company

High-Powered Hatchbacks

A HANDFUL OF UPCOMING LUXURY CARS WILL FEATURE A BODY CONFIGURATION RARELY SEEN IN THE U.S.: THE HATCHBACK. THIS DESIGN ALLOWS MORE CARGO-HAULING FLEXIBILITY, CREATING SLEEK, PRACTICAL WAGONS. *BY LARRY WEBSTER*



3



1

2010
AUDI
A5 SPORTBACK

This crisply styled Audi A5 Sportback has just been released in Europe. Its graceful lines show a design that we think perfectly illustrates what this new genre has to

offer—incredible style mixed with practicality. Unfortunately, U.S. buyers will have to wait for the larger A7 Sportback. We hope it comes with diesel power.

2

2010
ACURA
ZDX

The ZDX is the more stylish offspring of the seven-passenger MDX. It's lower by about 6 inches and seats five but uses the same 300-hp 3.7-liter V6 and

all-wheel drive. The lower ride height should fulfill some of the sportiness the sleek exterior promises. The ZDX arrives early next year.

3

2010
BMW
5 SERIES GRAN TURISMO

The Gran Turismo's sloping backside has both a trunk and a hatch. Opening the trunk portion reveals a 15.5-cubic-foot cargo area that's

closed off from the main cabin. Folding the rear seats (which are adjustable fore and aft) yields a voluminous 59.5 cubic feet of space.



Calling your next appointment
from anywhere.



Calling a tow truck, stuck in the
middle of nowhere.



EXIDE® Batteries.
Start Positive. Stay Positive.™



Performance. That's what you can expect in every Exide NASCAR® Extreme™ battery we build. The kind of ultimate performance provided by our advanced Silver Shield protection that stands up to heat corrosion and combines superior anti-shock design with long-lasting starting power. In other words, it keeps on going so you can too. Plus, the Exide NASCAR Extreme is backed by the industry's best warranty. Want more positive news? Go to exide.com.



EXIDE
exide.com

Exide Technologies, Alpharetta, GA 30004-8532. Exide is a registered trademark of Exide Technologies.
NASCAR® is a registered trademark of the National Association for Stock Car Auto Racing, Inc.

Long-Term Test Cars

OUR TRUSTY SUBARU FORESTER MOVES ON, BUT A SPORTY AND LUXURIOUS AUDI TAKES ITS PLACE.

+
PM TEST
DRIVEN
+



+ Audi A4 Avant 2.0T Quattro

FIRST report

The meteoric rise and precipitous fall of the SUV in mainstream popularity could mean that Americans will return to their vehicular roots: the station wagon. For decades, it was the station wagon that was charged with the humble task of hauling the family. The trend may be back, with an edge.

Sport wagons offer brisk performance, smooth looks and, yes, plenty of room for stuff too. Even Cadillac is preparing an entry. Yet no car typifies this breed better than Audi's A4 Avant. The latest A4, all new for 2009, shares much of its chassis with the sporting A5 coupe, so deft han-

dling comes naturally. But under the hood is the real news: a 2.0-liter four-cylinder with more torque than many V6s—including Audi's own 3.2-liter V6. So, we decided to add one very hip, very black and very cool A4 Avant to our long-term fleet. Fully loaded, an A4 can creep well north of \$50,000.

VITAL STATISTICS Base price \$34,850 : As-tested price \$43,050 : Extra-cost options Premium Plus option, Navigation package with rearview camera, ash-almond beige interior trim : Drivetrain 2.0-liter turbocharged I-4, 6A, AWD : Engine performance 211 hp, 258 lb-ft of torque : EPA fuel economy 21 city/27 highway



MASTER OF ALL THINGS HARDWARIAN

True Value®

START RIGHT. START HERE.®

Tools, products and expert advice for all your project needs.

startrightstarthere.com

PM LONG-TERM
TEST CARS

So, as much as we may have wanted the Drive Select system (\$2950) and Adaptive Cruise Control (\$2100), we left these options off the list. We did choose the navigation system (\$2500) with rearview camera because this wagon will soon become our de facto hockey road-trip rig. And speaking of hauling capability, it offers 17.5 cubic feet with all the seats in place, or 50.5 cubic feet when the second-row seats are folded flat. As an SUV alternative, does the Avant make the cut? Over the course of the next year, we'll load ours up and let you know.

— BEN STEWART



Engine size matters little when it comes to off-the-line thrust. The Avant's 2.0-liter turbo has a generous 258 lb-ft of torque.



Dodge Ram 1500 Laramie Crew 4x4

SECOND report

Our Ram was recently tasked with moving a houseful of furniture and the entire Saturday Mechanic shop into our new digs, a job it handled with alacrity and competence. The rear seats fold out of the way, leaving a padded cavern for fragile things that absolutely, positively can't get wet. Though the 5-foot-7-inch-long cargo box is far from a work truck's full 8-foot-long bed, it has been adequate for loading long couches. The integrated cargo tie downs, which slide along rails inside the box, make it easy to keep stuff inside the bed, even when the tailgate is down. And those supremely comfortable power seats make work seem less so. They had better be, considering this truck stickers for over 50 large. The backup camera is especially handy when maneuvering into a loading dock with the cab and bed full to the roofline. Our only grumble? The cheap plastic trim on top of the tailgate said adios after just three loads. We recommend upgrading to a metal one just as shiny as the Ram's grille and bumpers. — MIKE ALLEN

**DRIVERS
NOTEBOOK**

- We're limber, but it's a fairly long way up to the cab without side steps.
- The between-seat console holds about a cubic foot

of gear. But make sure to close the lid before driving off; it slams shut with a bang when you touch the brakes the first time.

DATA SO FAR

As tested :
\$52,520
Previous reports :
See 08/09
Miles driven : 2222
Miles since last report : 2222
Fuel economy :

Average—
14.8 mpg
Worst—14.1 mpg
Best—16.6 mpg
Maintenance/
repair : \$248.00
(replacement tire,
mounted and
balanced)



VW Jetta TDI Loyal Edition

THIRD report



For the past 2100 miles the Jetta has served as our L.A. runabout—crossing from the east side of town to the west almost daily. And like many Angelenos, we've avoided the freeways. That means our fuel economy has suffered somewhat. But salvation came in the form of our annual pilgrimage to the Pebble Beach Concours d'Elegance, the most prestigious and highfalutin car show weekend in the country. What better car to take to this showcase of million-dollar metal than our snow white Jetta diesel? Our colleague arrived at the posh hotel on the Monterey peninsula in a bold, snorting sports coupe. The valet ignored him and instead asked us what kind of mileage our Jetta delivered. The trip from L.A. to Monterey returned 40 mpg, we said. He nodded in approval.

Weighing your options?



Don't forget to factor in:

STOPPING DISTANCE	LONGEVITY	SNOW TRACTION
Up to 7' SHORTER in wet conditions ¹	Up to 20,000 MILES LONGER than the competition ²	8% MORE BITING EDGES than the MICHELIN [®] LTX [®] M/S Tire

The best light truck tire on the road just got better with the new MICHELIN[®] LTX[®] M/S² Tire. With all-season durability, this tire offers an exceptional combination of performance for both pickups and SUVs. Plus, it stops shorter¹, has better snow traction³ and lasts longer² with a 70,000-mile manufacturer's limited warranty⁴...so weighing your options just got easier.

For the Michelin dealer nearest you, visit www.michelinman.com/ms2



1 – Based on wet braking test results for LT-metric sizes versus Bridgestone[®] Dueler[™] H/T 684 II and Goodyear[®] Wrangler[®] SilentArmor[™].
2 – Based on p-metric wear test results versus Bridgestone[®] Dueler[™] H/T 684 II and Goodyear[®] Fortera[®] TripleTred[™] SA. 3 – As compared to the original MICHELIN[®] LTX[®] M/S Tire. 4 – See Warranty Book for details. Copyright ©2009 Michelin North America, Inc. All rights reserved.

"It's got a lot of torque too, right?"
Yep. Amongst these exquisite, finely
tuned four-wheeled stallions,
sometimes the efficient workhorse
is the most impressive pony in
the barn. —B.S.

DRIVERS

NOTEBOOK

- On Highway 1, we decided the Jetta TDI needed the sportier suspension tune.
- The Jetta could use more eco cred—some aero tweaks to distinguish it from pedestrian Jettas?

DATA SO FAR

As tested :
\$24,190
Previous reports :
See 05/09,
08/09
Miles driven :
10,004
Miles since last
report : 2884
Fuel economy :
Average—32 mpg
Worst—26.3
mpg
Best—40.7 mpg
Maintenance/
repair : \$0

Our Subaru has been in high demand by PM staffers recently, thanks to its spunky dynamics and generous cargo capacity. Since our last report we've hauled a dresser from Pennsylvania to New York, thrown bicycles in the back to escape for a day of riding and packed it tight with camping supplies for numerous weekend trips. Unfortunately, the last 5000 miles haven't taught us to love the Subaru's display and navigation system. On a 450-mile haul to North Carolina, the rays peeking through the sunroof rendered the screen completely useless. And a couple of questionable nav-system routings taught us to keep our road atlas within reach. But our enchantment with the Forester will linger long after it leaves the fleet. Far too often we've caught ourselves pushing the XT's powerful turbo motor hard on the open road. Loaded with five people and their gear, the engine showed no sign of strain. And as if reminding us it's bred from the same stock as the WRX, the Forester had no trouble outmaneuvering taxis and behemoth buses on crowded streets. We hope to cross paths with the Forester again soon. —EMILY MASAMITSU

DRIVERS

NOTEBOOK

- A balky nav-system screen was replaced, including the entire stereo, under warranty in just under an hour.
- We powered over a curb, but on the way down heard the nasty scrape of the tow hitch. But, hey, it doesn't say "Jeep" across the tailgate, does it?

END DATA

As tested :
\$32,420
Previous reports :
See 02/09,
05/09, 08/09
Miles driven :
14,336
Miles since last
report : 5209
Fuel economy :
Average—
21.8 mpg
Worst—18.2 mpg
Best—25.5 mpg
Maintenance/
repair since last
report : \$0
Overall : \$55.98

+ Subaru Forester 2.5XT Limited

FINAL report



PHOTOGRAPH BY JEN DESINGER

 FIERCELY MADE IN
MEADVILLE, PA.



**Deployed from Meadville.
Currently serving all over the world.**

The 420® Tongue and Groove Plier. It's 13.9 oz. of American-made high carbon steel that won't take no for an answer. Its laser-hardened teeth grab tight and hang on. Great for wrenching on pipes, busting nuts and adjusting attitudes. Goes anywhere. Does everything. Too bad the Special Forces aren't currently accepting pliers. It's time you owned a CHANNELLOCK® tool.

CHAN NEL LOCK

WORK HARD. SWEAT BLUE.®

© 2009 CHANNELLOCK, Inc. Meadville, PA 16335 www.channellock.com



CHANNELLOCK
FOOTBALL
CHALLENGE

Enter the CHANNELLOCK® Football Challenge to win a 5-piece Home/Pro Tool Roll at www.ChannellockSweepstakes.com

JET-SETTER

> BY JAY LENO
> PHOTOGRAPHS BY JOHN LAMM

W

hen I was a kid, jet-powered cars seemed like the future. I watched *The Jetsons* on TV, and they'd get in their jet car, fire it up and zip away. I read about the Rover-BRM gas turbine car in the '60s, and I went to the New York World's Fair in 1964 to see Chrysler's own spin around and around on the stand. I've always been a big fan of these cars. And recently, I was able to buy one of the nine original turbine cars from Chrysler. Owning it has been the thrill of a lifetime. Even though my 1963 Chrysler turbine car was built 45 years ago, to this day, when I'm driving it, people say, "Ooooh, look how smooth that car is!"

So I thought, why not try to build a

JAY'S CUSTOM-BUILT TURBINE SUPERCAR RUNS BIODIESEL AND COULD THEORETICALLY TOP 245 MPH.

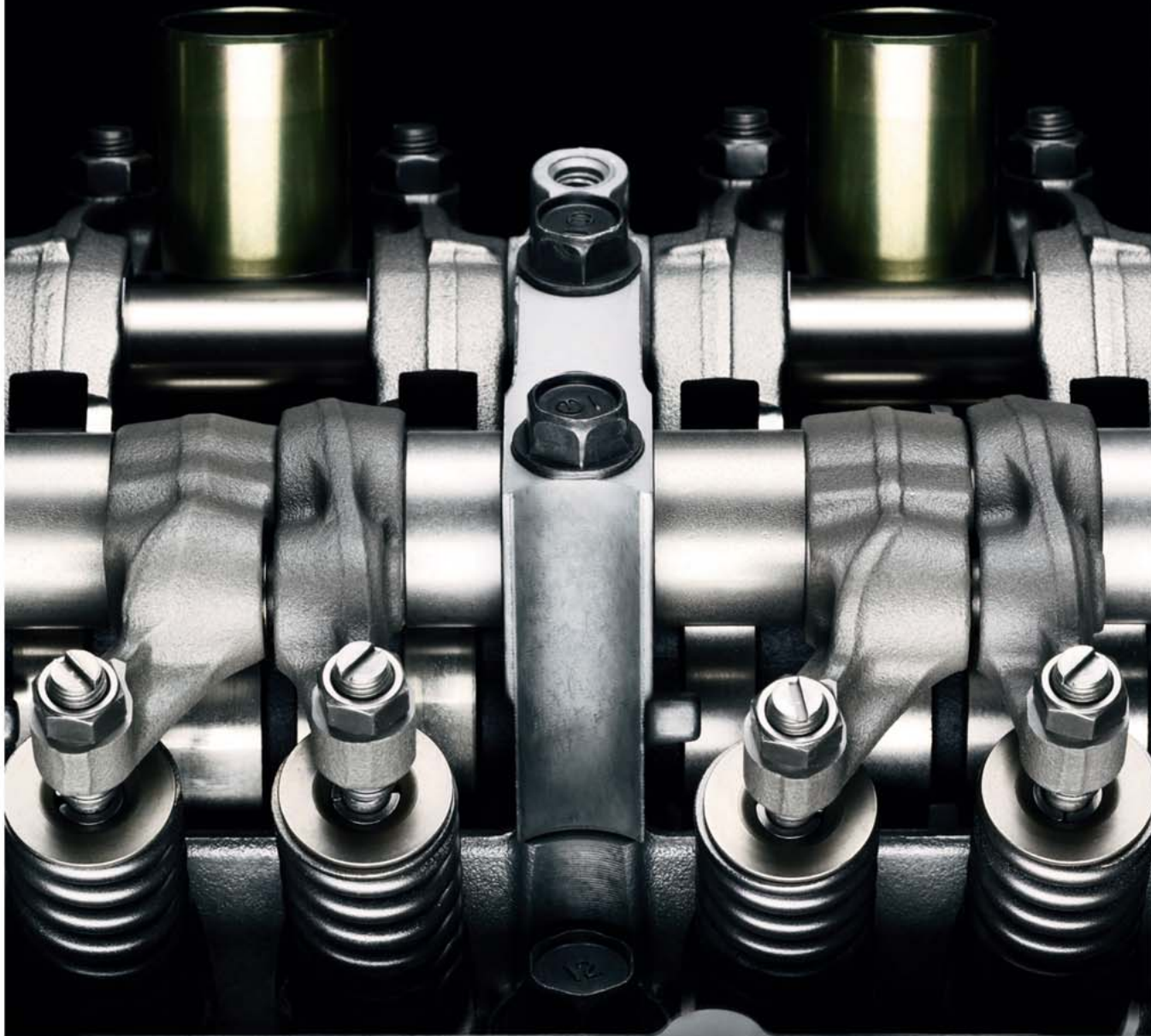
new one? It would be great if I could run a turbine car on biodiesel, especially a nonfood-sourced fuel. So I sat down with Steve Anderson and Frank Saucedo from General Motors' Advanced Design Studios and told them what I had in mind. I'm not a designer, so I couldn't really convey what I was looking for; they had to give me some ideas. They'd sketch



→ Jay's sleek EcoJet turbine supercar was inspired by the 2002 Cadillac Cien show car, as well as by GM's 1950s Firebird jet cars designed by legend Harley Earl.

1

What if the last 75,000 miles never happened to your engine?



©2009 Exxon Mobil Corporation. Mobil and Mobil 1 are registered trademarks of Exxon Mobil Corporation or one of its subsidiaries. NASCAR is a registered trademark of The National Association for Stock Car Auto Racing Inc. Trademarks granted by license from Penske Racing South, Inc.



Revitalize your car's performance with Mobil 1 High Mileage. Help give your engine a fresh start with Mobil 1 High Mileage, the oil that outperforms all conventional oils. It not only reduces sludge and other deposits from engines with more than 75,000 miles, it also helps recondition seals and prevent leaks. If you want to help maximize your engine's performance and extend its life, get Mobil 1 High Mileage today. Learn more at mobil1.com.

Official Motor Oil of
NASCAR

Mobil 1

JAY LENO'S GARAGE /// TURBINE CAR

something and ask, "Is this it?" I'd say *nooooo*, and then they'd offer another design: "How about this?" I remember Ed Welburn, GM's VP of global design, was at one of our meetings, sketching on cocktail napkins. I mentioned that I liked the look of the Cadillac Cien show car. The GM design team kept sketching. I knew I'd know the right design as soon as I saw it. And I did.

We decided to call the car the EcoJet, and it was one serious project. My chief mechanic, Bernard Juchli, along with fabricator Jim Hall and the rest of the guys in the shop, did a wonderful job building it. Metalcrafters, the company that builds many of the concept cars at auto shows, constructed the carbon-fiber-over-Kevlar body. The chassis was basically built in-house at my garage. Alcoa provided technical support for the hydro-formed frame

rails, aluminum space frame, the sub-frame structures and the turbine-blade-inspired forged alloy wheels. Each one of those wheels was made from a 400-pound billet of aluminum.

In keeping with this car's environmentally friendly theme, we didn't want to use any animal-sourced products. Instead, the interior is crafted from materials that can be recycled, like Alcantara, a man-made suede.

We used as many GM components as we could, like the Brembo carbon-fiber brakes—the same ones used in the Corvette ZR1. The suspension arms come from a Z06 C6 Corvette, as do the heavily modified frame rails.

The turbine itself is a Honeywell LTS-101, like the ones used in Bell 222 and U.S. Coast Guard Dolphin helicopters. It puts out 650 hp and 583 lb-ft of torque. A four-speed automatic transaxle was adapted from a C5 Corvette. We had to use an automatic because the turbine requires a constant load. A manual would cause the turbine to overspeed—like push-



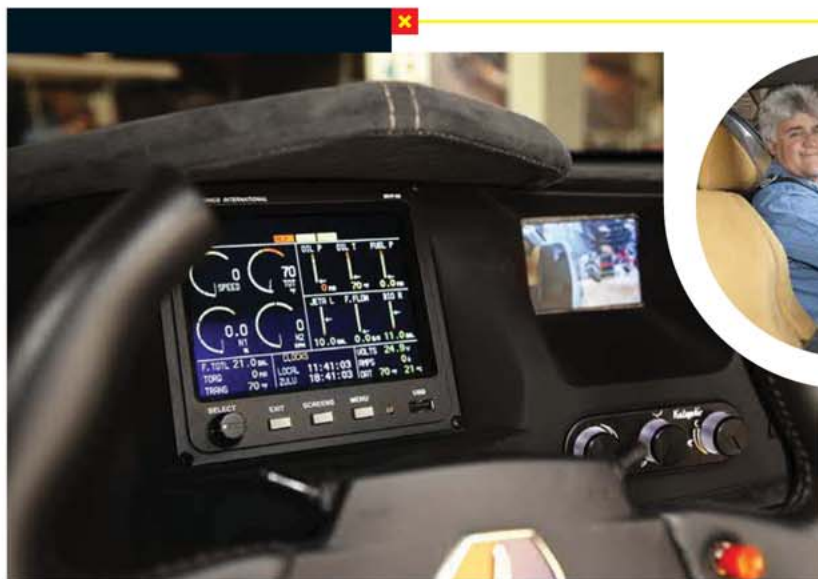
ing in the clutch on a car with the engine redlined.

Because the jet runs at 60 percent of its maximum 40,000 rpm at idle, the output shaft speed translates to 3300 rpm. So we asked Hot Flush to engineer us a custom torque converter with a stall speed of 3500 rpm—just above the turbine's idle. But here's the fun part. In order to reduce the overall length of the car, we stacked the engine on top of the transmission. Weismann, the same talented guys that built the transaxle for the McLaren F1, constructed a 1:1 transfer gearbox that drops the output shaft of the engine 6 inches, reverses rotation and sends the power back to the torque converter, not unlike a V-drive in a boat. And these guys are right here in California. (Southern California is still the hot-rodding capital of the world.)

When the EcoJet was finished, we raced a jet plane on an airport runway, and we beat 'em up to 160 mph. Speed's not a problem for this car; it's geared to do 245 mph. The turbine needs to spool up to generate power, so there's a noticeable lag before it picks up speed. You put your foot on the brake, bring up the revs, then accelerate. As with

any jet engine, all that power is up at the top end of the range. It's a lot of fun to drive on the street and it's extremely smooth. But this car is very noisy, and that racket comes mostly from the air intake. Chrysler's engineers were geniuses back in the '60s. Their turbine is reasonably quiet because they wanted people to hear that jet engine sound—*whirrrrrr*! We're working with K&N and Flowmaster to seal the intake better and develop a filtering system to cut the noise. We basically need an intake muffler.

I'll admit the fuel economy isn't great. The glass cockpit has a fuel-flow meter, and the EcoJet idles at



→ Electronics International created the instrument display (above). It's a "glass cockpit" adapted from turbine-powered aircraft for street use. Microsoft and

Azentek engineered the nav and audio systems so that Jay can use the Internet as well as send and receive e-mails from the EcoJet's front seat—when the car is parked, of course.



Truly Unique



Time travel at the speed of a 1935 Speedster?

The 1930s brought unprecedented innovation in machine-age technology and materials. Industrial designers from the auto industry translated the principles of aerodynamics and streamlining into everyday objects like radios and toasters. It was also a decade when an unequaled variety of watch cases and movements came into being. In lieu of hands to tell time, one such complication, called a jumping mechanism, utilized numerals on a disc viewed through a window. With its striking resemblance to the dashboard gauges and radio dials of the decade, the jump hour watch was indeed "in tune" with the times!

The Stauer 1930s Dashtronic deftly blends the modern functionality of a 21-jewel automatic movement and 3-ATM water resistance with the distinctive, retro look of a jumping display (not



True to Machine Art esthetics, the sleek brushed stainless steel case is clear on the back, allowing a peek at the inner workings.

an actual jumping complication). The stainless steel 1 1/2" case is complemented with a black alligator-embossed leather band. The band is 9 1/2" long and will fit a 7-8 1/2" diameter wrist.

Try the Stauer 1930s Dashtronic Watch for 30 days and if you are not receiving compliments, please return the watch

for a full refund of the purchase price. If you have an appreciation for classic design with precision accuracy, the 1930s Dashtronic Watch is built for you. This watch is a limited edition, so please act quickly. Our last two limited edition watches are totally sold out!

Not Available in Stores

Stauer 1930s Dashtronic Watch **\$99 +S&H or 3 easy credit card payments of \$33 +S&H**

Call now to take advantage of this limited offer.

1-800-859-1602

Promotional Code DRW316-02
Please mention this code when you call.

Stauer
HERITAGE OF ART & SCIENCE

14101 Southcross Drive W.,
Dept. DRW316-02
Burnsville, Minnesota 55337
www.stauer.com

This is no place to skimp.



**Buy One Get One Free
at Prestone.com**

Prestone® 50/50 Ready-to-Use Extended Life Antifreeze/Coolant is formulated to protect any make or model car, and mixes with any color antifreeze. It's perfectly pre-mixed, so you just pop, pour and protect.

Prestone®
ONLY PRESTONE IS PRESTONE

www.prestone.com ©2009 Honeywell International, Inc.

A Honeywell car care product.

P M

JAY LENO'S GARAGE /// TURBINE CAR



8 to 9 gallons per hour. At 70 mph we burn 14 gph, and at full throttle it burns around 57 gph. Remember, this is a jet.

When the original Chrysler turbine came out in the '60s, you'd have to go to a truck stop to fill up with diesel, or use home heating oil.

But the EcoJet also runs on B100 biodiesel. We get ours from Seattle Biodiesel. There are two 18-gallon fuel tanks: a left tank for Jet A fuel and a right tank for biodiesel. We start the car on jet fuel and switch to B100 once we're out on the road. We always switch back to jet fuel before shutdown, so we don't gum up the fuel-control unit. We haven't noticed a real fuel-economy difference between the two fuels. A turbine gobbles any fuel that burns with oxygen—*uuurrrrrppp!* It's like a big guy at a buffet. It just eats everything.

Refining the car has been a continual process. The doors operate

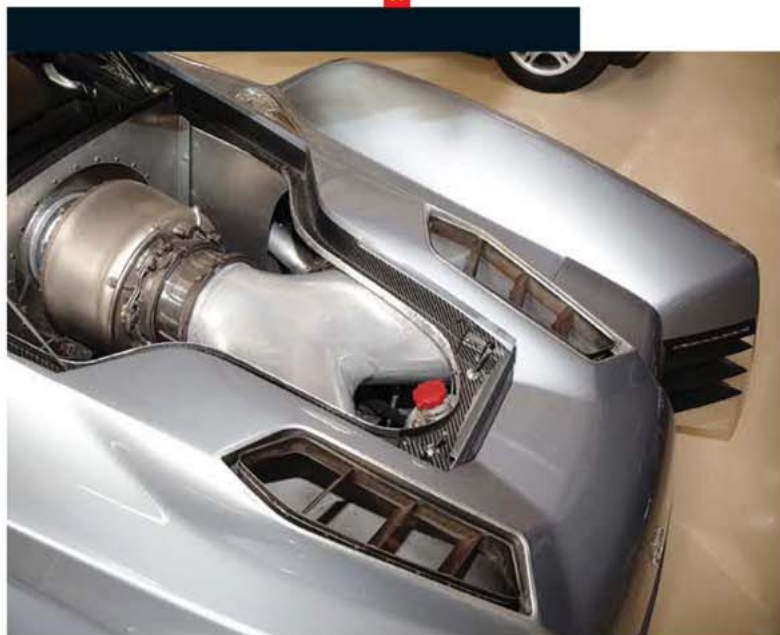
with solenoids. Push a button and it goes *kercluuunnk*—so we'll find a quieter switch. But the really tough part is done. It's on the road now, and it doesn't overheat. The transmission fluid stays very cool, and the car runs smoothly.

I like that the EcoJet is a usable vehicle that looks like a car of the future. There's a Batmobile quality to it. You get the feeling you're on your way to fight crime when you get into it. But that concept car look is balanced with practicality. It's not one of those "You could never drive that; look where the headlights are!" kind of cars.

Okay, so there's no trunk. You wouldn't want to take it on a trip. Since I don't play golf, I don't really care about room for a golf bag. There's about the same amount of storage space as there is in an Audi R8. You can carry an insurance card and one pack of M&M's.

That's enough for me.

PM



→ The EcoJet's thrust comes from a massive 650-hp Honeywell LTS-101 helicopter turbine that runs on B100

biodiesel or jet fuel. This is one show car that was built to be driven. Jay has taken the EcoJet on the road

to events such as Supercar Sunday, a weekly sports car and hot-rod gathering in Woodland Hills, Calif.

SOME CORNERS YOU JUST DON'T CUT.



These days, it's tempting to try to save a buck or two. But your inner car guy knows your engine is no place to skimp. Just look for the big yellow jug and you're always covered. Prestone® 50/50 Ready-to-Use Extended Life Antifreeze/Coolant is formulated to protect any make or model car, and mixes with any color antifreeze. It's perfectly pre-mixed, so you just pop, pour and protect.

Prestone®

ONLY PRESTONE IS PRESTONE

THE GOODS

GREAT PRODUCTS AND PROMOTIONAL OFFERS FROM PM ADVERTISERS

AUTOMATIC STANDBY GENERATOR

Stand up to unpredictable weather and unforeseen outages with the most trusted name in residential standby power. If the power ever goes out, your **Generac** standby generator goes on — automatically — protecting you and your home 24/7. Generac backs you up with a full line of affordable models and the largest sales and support network in the country. Call 1-888-GENERAC to learn more. Never feel powerless™.



GENERAC

For more information, visit www.neverfeelpowerless.com



WIX
FILTERS

WIX CABIN AIR FILTERS WITH BIOSHIELD 75

The air inside your vehicle has significantly higher concentrations of pollutants such as soot, dirt and pollen than the outside air, which can cause a variety of problems, ranging from foul odors, to headaches and allergic reactions. If these symptoms sound familiar, it may be time to change your cabin air filter. **WIX Cabin Air Filters with BioShield 75** can keep allergens, dust mites, toxic fumes and smells from entering your vehicle.

For more information, visit www.wixfilters.com

GET TOUGH WITH SCOTCH® TOUGH DUCT TAPES



Scotch® Tough Duct Tapes deliver the strength, reliability and quality you've come to expect from 3M. From a strong, weather-resistant tape that comes off without

residue for up to six months to a moisture-resistant tape that virtually disappears when applied, there's a Scotch® Tough Duct Tape to meet your most demanding applications. When conditions are harsh and projects are tough, Scotch® Tough Duct Tapes are even tougher!

Scotch and the Scotch Tough Duct Tape Design are trademarks of 3M.

For more information, visit www.ScotchToughTape.com

TIMBERLAND PRO HELPS YOU STAY ON YOUR FEET

Timberland PRO is committed to helping you stay on your feet in more ways than one. Timberland PRO Endurance work boots provide all-day standing comfort using an innovative anti-fatigue technology, while its site – stayonyourfeet.com – offers unique access to the jobs you're looking for.



For more information, visit www.stayonyourfeet.com and sign up to receive updates on new job listings in your area.

WEATHERTECH® FLOORLINERS™

WeatherTech® FloorLiners™ are the most advanced vehicle accessory available today! FloorLiners™ are made from a unique semi-flexible material engineered to completely line your vehicles' interior carpet; providing "absolute interior protection™." FloorLiners™ are a perfect fit for over 400 vehicles and are available in black, tan and gray.

WeatherTech®, where Technology and All-Weather Protection meet!



MacNeil
AUTOMOTIVE
PRODUCTS LIMITED

For more information, please visit www.weathertech.com or call (800) 441-6287.

G-Defy Benefits

- Relieve all pains
- Ease joint & spine pressure
- Reduce fatigue and tiredness
- Be more active
- Have more energy
- Appear taller
- Jump higher, walk and run faster
- Have instant comfort
- Cool your feet & reduce foot odor
- Elevate your performance

**Smart memory
Springs**
designed in USA



by Impact Research
Technology Labs

Scientifically and mechanically engineered for pain relief. Guaranteed!

Walk and run faster, jump higher, no fatigue or pain.

Will G-Defy be banned from Athletic Competition?

Should they be considered as an unfair advantage? We don't know; all we can tell you is that this new technology in footwear will take your performance to the next level.



Advanced Technology in Footwear

Years of research went into the original Gravity Defyer Shoes. Starting with the same concept used in automobiles, (spring shocks combined with inflatable rubber tires) scientists at the Impact Research Technology Lab developed the first bionic comfort footwear.

Genesis of Athletic Excellence

For those who want to elevate their game to the next level, these are the shoes for you. Owning a pair of G-Defy shoes today will change your spirit and make a difference in your athletic condition and your health. Feel the drive, the inspiration, the energy rush as soon as you slip your feet into the most exhilarating shoes in the world! Go from the weekend warrior to the daily champion at your gym and on the street.

The Technology of a Smart Spring

Within 10 days of regular use, the special combination of space age rubber and lightweight, durable springs will adjust to your activities and begin to improve your overall comfort. Give your whole body a break from the stress of your high impact life. Active Sport Gravity Defyer Shoes provide you with access to a

breakthrough in your athletic lifestyle. Be in action. Be unstoppable. Be comfortable and live pain free.

Great news for the Overweight?

The extra weight you've collected over the years puts an added toll on your bones and joints. Running isn't an option, and walking is becoming more difficult. The G-Defy Shoes will take the pressure from your large frame body, make you more active and change you forever!

Ease Joint Pain

You will notice immediate relief of common pain during exercise as the springs of the G-Defy shoes absorb most of the impact, rather than your body. The shock absorption power of the Active Sport G-Defy Shoes eases the stress and impact of walking, running, and jumping on your joints, back and neck.

TB902MBL Men's Black
TB902MW Men's White
sizes 7.5 - 13.0
widths M(D), W(2E)

TB902FWS Women's White
TB902FB Women's Black
sizes 6.0 - 11.0
widths W(D), WW(2E)

Try them FREE for 30 Days.

(your card will not be billed)

Order your G-Defy Athletic Shoes today at

www.gdefy.com/MC8LAC

Call (800) 429-0039

mention offer code: MC8LAC

100% Satisfaction Guaranteed, Nothing to Lose but your pain.

30 Day Money Back Guarantee. If not satisfied just send them back for a full refund of purchase price.



Patented Shock Absorbing
Polymer Sole

Comfort Insole

AVS3 Air
Circulation Channels

Twin Stabilizer Coils

Master Memory
Spring Shock Absorber

85%
Ankle & foot
pain gone

90%
Exercise
20% longer
w/ no
fatigue

91%
Most comfortable
shoe ever owned

87%
4 out of 5
purchase
another pair
within 3 mos.

Clinical Survey - Survey conducted of 152 Gravity Defyer customers using the guidelines of New York College of Podiatric Medicine. 73% male and 27% female.

2009 *BREA*



AVIATION: COAXIAL ROTOR HELICOPTER

INNOVATORS: X2 Technology Development Team (seven of the 16 members of the team are pictured above); Sikorsky Aircraft

BRILLIANT IDEA: A coaxial, or stacked, rotor design that overcomes dissymmetry of lift, allowing engineers to design the world's fastest helicopter—by a factor of two.

KTHROUGH AWARDS

by Logan Ward

PHOTOGRAPH BY
WILLIAMS & HIRAKAWA

WE NEED INNOVATORS. Sure, we need their inventions: the medical tools, the batteries for storing wind power, the efficient engines and agile robots. But we also need their spirit of inquiry to inspire us, their mix of skill and imagination to remind us how real work gets done. America's famed inventive energy is no illusion. There's no

Ponzi scheme or bubble in the genius markets, but a true wealth of passionate, smart creators. PM has been presenting these awards for five years now, and we've considered thousands of potential winners. So we know. The fundamentals are strong. Innovation promises a brighter future. And the breakthroughs keep coming.



LAST YEAR IN THE town of Horseheads, N.Y., Kevin Bredenbeck became the first pilot to fly Sikorsky Aircraft's X2 technology demonstrator. The successful test proved that the X2 engineering team

had overcome a basic limitation in rotary-wing aerodynamics—and had set itself on the path to building the world's fastest helicopter.

The problem with fast helicopters is a phenomenon

called dissymmetry of lift. When a helicopter starts to fly forward, the advancing blade cuts through the air faster, and it generates more lift. At the same time, the retreating blade's relative velocity and

Members of the X2 team, photographed for POPULAR MECHANICS on July 28 at the Sikorsky Development Flight Center in West Palm Beach, Fla., where the helicopter is undergoing flight testing. Left to right: ● Steve Cizewski ● Dave Walsh ● Ken Arifian ● Mark K. Wilson ● Kevin Bredenbeck ● Steve Weiner ● Jim Kagdis

lift decrease. The faster the helicopter goes, the greater the discrepancy. If the speed increases too much, the machine will tend to roll to one side and the retreating blade will stall, generating no upward force at all. The speed limit for any conventional helicopter is about 185 mph. But that wasn't good enough for Steve Weiner, the X2's chief engineer: "We wanted to go faster."

Weiner's team replaced the single rotor with twin, 26.4-foot-long rotors that spin in opposite directions on the same axis. The rotors both produce dissymmetry of lift, but in countervailing directions. Goodbye, instability. Hello, speed records.

The X2 is the descendant of the XH-59A, a machine with the same stacked rotor configuration that the company built with NASA and the U.S. Army in the 1970s. It was unwieldy, and the project was shelved—but Sikorsky engineers never gave up on it. In recent years, they innovated a new vibration-control system and digital fly-by-wire controls, and added a pusher propeller on the tail to boost speed. (The X2 doesn't need a tail rotor, which counters a typical helicopter's tendency to spin in place.)

Sikorsky doesn't know whether its first clients will be military or commercial or both. For now, the X2 team has set the speed bar high—at 287 mph. "But the physics say we can probably go to 300 knots," Weiner says. At that speed—nearly 350 mph—a medical transport helicopter could fly 150 miles, pick up a patient and return to a hospital by the time a conventional helicopter simply arrived on the scene.

'09

breakthrough awards

APPROPRIATE TECHNOLOGY: MICROBIAL FUEL CELL

INNOVATORS: Aviva Presser Aiden, Alexander Fabry, Stephen Lwendo, David Sengeh, Zoë Vallabha, Hugo Van Vuuren; Lebônê

BRILLIANT IDEA: A bacteria-powered battery to help Africans light their homes.



These small pouches of cheap wire and manure-rich soil can power lamps and charge cellphones. From left: Aviva Presser Aiden, Hugo Van Vuuren and Stephen Lwendo, photographed for PM on Aug. 7 in Cambridge, Mass.

FOR A CENTURY, scientists have known that a trickle of electricity could be harvested from the metabolic reactions of bacteria living in soil. To most scientists, it was a parlor trick—a lot of effort to generate a tiny current. Now, a team at Harvard called Lebônê has used the idea to design an inexpensive battery for use in sub-Saharan Africa, where more than 500 million people live without power. The microbial fuel cell, or MFC, can produce enough current to power LED lights and charge cellphone batteries. In 2008, Lebônê (the word means "light stick" in southern Africa's Sotho language) field-tested its first prototype in Tanzania, the home country of team member Stephen Lwendo. Simple and cheap, the MFC came in a 5-gallon bucket. It consisted of a graphite-cloth anode, a chicken-wire cathode, manure-rich mud for fuel, a layer of sand to act as an ion barrier and salt water as an electrolyte—all attached to an electronic power-management board. In June 2009, team members traveled to Namibia to launch a pilot program featuring 100 MFCs made from small canvas bags that can be linked for increased voltage. The bags are filled with dirt and buried. When watered to keep the microbes munching, the buried cells can produce power for months. "Rural Africans are used to getting resources out of the ground," says team member Aviva Presser Aiden, a doctoral student in applied math and genomics at the Broad Institute of MIT and Harvard. "We want to tap that familiarity."

PHOTOGRAPH BY DENNIS KLEIMAN

COMPUTING: GESTURE-BASED USER INTERFACE

INNOVATORS: Alex Kipman, Don Matrick, Kudo Tsunoda; Xbox 360's Project Natal
BRILLIANT IDEA: Allow users to control a computer with natural movements.

THE COMPUTER KEYBOARD and mouse do an admirable job of letting users drag and drop words, numbers and pictures. But gaming presents a far tougher test for any user interface—it requires us to swing bats, turn wheels, duck through doorways. “You’re trying to translate a real-world action to the corresponding buttons on a controller,” says Alex Kipman, director of incubation for Microsoft’s Xbox. “A lot gets lost in translation.”

This explains the runaway success of the Nintendo Wii—the motion-sensing wand controller has proved irresistible to millions. Now, Microsoft is going even further with Project Natal, a yet-to-be-released peripheral for the Xbox 360.

Instead of mashing buttons—or even swinging wands—players can use their entire bodies.

This sorcery relies on some standard technologies: a Web camera and a near-infrared depth sensor that track movement even in the dark, plus sophisticated microphones. Natal recognizes your voice and face, interprets your gestures and translates everything into an avatar that interacts with onscreen objects.

The implications go far beyond gaming. The technology could help smart houses monitor their owners’ health, or allow engineers to sculpt 3D shapes with their hands. Some day, such computer interfaces could seem as ordinary as the PC keyboard does today.

Natal sensors track 48 points on the user’s body to create his onscreen representation.



Natal developers Alex Kipman, left, and Don Matrick, Aug. 17 on Microsoft’s campus in Redmond, Wash.

PHOTOGRAPH BY JOHN KEATLEY



ASTRONOMY: PLANET-SEEKING SPACE TELESCOPE

INNOVATORS: Eric Bachtell (Ball Aerospace), William Borucki, David Koch (NASA), Doug Caldwell, Jon Jenkins (SETI Institute), David Latham (Harvard-Smithsonian Center for Astrophysics)

BRILLIANT IDEA: A multiyear survey of 100,000 stars, in search of planets where alien life may thrive.

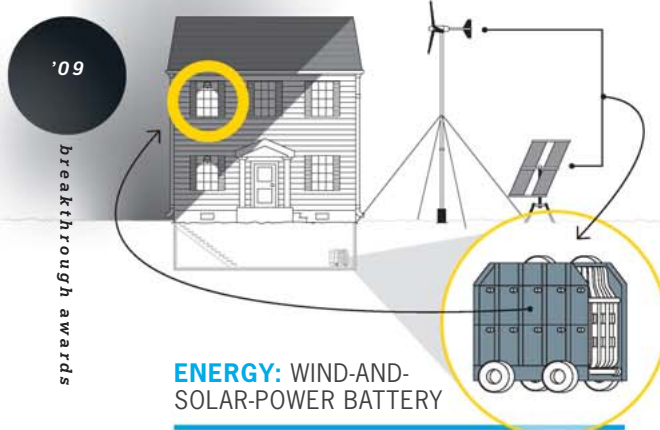
AS PRESIDENT OF HIS Delavan, Wis., high school science club in the 1950s, William Borucki helped build a device—a magnetometer coupled with ultraviolet and infrared transmitters—to contact UFOs. The technology was sound, but the test subjects never showed up. However, Borucki, now a space scientist at NASA's Ames Research Center, didn't abandon his preoccupation with aliens. For two decades, he has argued that by taking pictures of planets as they pass in front of their home stars, scientists could identify likely sites for life in other solar systems.

He and his colleagues persevered in the face of enduring skepticism from NASA managers. Borucki and Doug Caldwell of the SETI (Search for Extraterrestrial Intelligence) Institute proved they could capture the images with charge-coupled devices, or CCDs, like the ones used in digital cameras. SETI's Jon Jenkins wrote algorithms to distinguish small planets from the "noise" of deep space. Fellow Ames scientist David Koch banged together a miniature steel-and-Styrofoam demonstrator with the help of machine shops in the Bay Area. "By 2000, we had done all the things they asked," says the soft-spoken Borucki, now 70

years old. With the launch of an instrument-laden rocket last March, the mission, dubbed Kepler, became reality.

The spacecraft will aim its 42 CCDs at a group of 100,000-plus stars in our region of the Milky Way (within 600 to 3000 light-years of Earth). If a planet transits in front of its star, the instrument will record a change in brightness, helping researchers to deduce the planet's size. Further observations will yield the length of its orbit, an estimate of its temperature and a judgment on whether liquid water might exist there. The mission will last until at least 2012—and hopefully bring us a step closer to fulfilling Borucki's youthful ambition of glimpsing signs of alien life.

The Kepler telescope—a 15-foot-long, \$600 million tool for finding Earth-like planets—captured its first image in April.



ENERGY: WIND-AND-SOLAR-POWER BATTERY

INNOVATORS: Grover Coors, John Watkins; Ceramtec

BRILLIANT IDEA: A whole-house battery that could help make home generation of electricity a mainstream alternative.

THE MOST POPULAR alternatives to fossil fuels for generating electricity—wind and solar—don't look so good once the sun sets and the wind dies down. To provide a home with reliable power, either technology must be coupled with an energy-storage system. For now, that means a bank of lead-acid batteries. But there's a better way, according to research scientist Grover Coors. "The problem [with lead-acid batteries] is they tend to fail after a few hundred charge-discharge cycles," he says. "We need a battery that cycles so many times we lose count." Sodium-sulfur batteries are a promising alternative, but only for industrial settings—they operate at temperatures around 600 F, far too hot to sit in anyone's basement.

Coors was the chief scientist at CoorsTek, an advanced ceramics company founded by his great-grandfather, the brewer Adolph Coors, when the company bought a ceramics R&D firm last year. Coors knew that the new subsidiary, Ceramtec, was working on a material that could form the electrolyte heart of a sodium battery cool enough for residential use. Coors and fellow researcher John Watkins built a promising prototype by sandwiching the material—a sodium super-ionic conductor—between a sodium metal anode and a still-undisclosed aqueous cathode. Now they hope to develop a \$2000 refrigerator-size unit that can yield 5 kilowatts for 4 hours before recharging—and keep it up for 10 years. If they succeed, it could help bring at-home generation of electricity from the margins into the mainstream.

PHOTOGRAPH COURTESY OF NASA; DIAGRAM BY DOGO

A man in a dark suit and white shirt is kneeling inside a large, circular vacuum chamber. He is wearing white gloves and is working on a complex piece of machinery, which is a plasma thruster. The chamber is filled with various wires and components. A yellow line points from the text to a specific part of the machinery.

This electromagnet guides nitrogen plasma at high speeds, in a process that may propel future spacecraft.

MIT's vacuum tank subjects Oleg Batishchev's plasma thruster to space-like conditions. Photographed for PM on July 30.

SPACE EXPLORATION: MINI-HELICON PLASMA THRUSTER

INNOVATOR:

Oleg Batishchev; Massachusetts Institute of Technology

BRILLIANT IDEA: A plasma engine powered by nitrogen, with 10 times the efficiency of chemical rockets.

CHEMICAL ROCKETS are ponderous. The space shuttle, for instance, carries more than 3.8 million pounds of expensive propellant—even empty, its two solid boosters weigh 193,000 pounds apiece. Oleg Batishchev, principal research scientist at MIT's Department of Aeronautics and Astronautics, appreciates such rockets for their raw, Earth-escaping punch. But once a craft hits orbit, he says, his new invention makes more sense: The Mini-Helicon Plasma Thruster is designed to be a lighter, cheaper way to move through space.

Batishchev's engine relies on the accelera-

tion of plasma, a gaseous cloud in which atoms have been stripped of their electrons, making the entire mass highly conductive and responsive to electromagnetic fields. NASA developed a similar engine for its Deep Space 1 Mission, launched in 1998, but the new thruster has advantages. To start, NASA employed pricey xenon gas (\$13 per liter) excited into plasma by delicate electrical components, while the new design uses nitrogen (5 cents per liter) activated by a rugged radio-frequency antenna. A magnetic field channels the plasma through a nozzle at a stunning 40 km/sec, an order of magnitude greater than the output of a chemical rocket. "For the same amount of fuel, we're getting 10 times more thrust," Batishchev says. That efficiency may one day win the thruster a trip to Mars. In the meantime, it could replace chemical rockets for pushing satellites from low Earth orbit to geostationary orbit. For this application, older ion engines are too pricey, Batishchev says: "If we're talking about applications like the privatization of space, this makes more sense."

PHOTOGRAPH BY GREG MILLER

MEDICINE: INEXPENSIVE LAB-ON-A-CHIP DIAGNOSTIC TOOL

INNOVATORS: George Whitesides, Emanuel Carrilho, Andres Martinez, Scott Phillips;

Whitesides Research Group, Harvard

BRILLIANT IDEA: A paper-based approach to microfluidics that will bring better medical testing to the world's poorest countries.

MEDICAL LAB TESTS are often expensive and slow. Thanks to microfluidics, also known as lab-on-a-chip technology, a new generation of handheld diagnostic devices may soon arrive in the world's advanced hospitals. The new technology will perform tests with greater automation—using much smaller samples of blood or other fluids—than today's methods. But Harvard chemist George Whitesides believes the high-tech tests can have their greatest impact in decidedly low-tech surroundings, namely poorly staffed and equipped medical facilities in developing countries. When he challenged his colleagues to create a microfluidics device for such a setting, they experimented with silicon and plastic chips, but eventually adopted a less pricey technology: paper. "Even a few cents for each device is expensive," group member Andres Martinez says. "The overarching goal of the project was to make essentially a zero-cost device." Not only is paper cheap and easy to produce in high volumes, but it can be incinerated after use, an advantage in poor regions where medical waste disposal is a challenge.

Paper naturally draws in liquids through tiny capillaries, eliminating the need for a typical lab-on-a-chip's miniaturized pump. The team embeds water-shunning polymers on the paper to form channels, which can lead a drop of blood or other fluid to tiny reservoirs filled with chemical reagents. The lab's first assay, or test, is for liver disease, a frequent side effect of AIDS medications. If blood contains alkaline phosphatase, a liver-disease biomarker, the reagent turns purple. In the future, a single postage-stamp-size device might test for the presence of a number of viruses and medical conditions. To run such a test, there would be no need to draw blood from a vein, refrigerate the sample or have access to electricity. The team hopes that test results could be photographed with cellphone cameras by minimally trained workers and transmitted to doctors and nurses for analysis. And while it's being designed for the rigors of the developing world, the technology has the potential to revolutionize diagnostics in industrialized countries as well.

'09

breakthrough awards



Patients touch a drop of blood to the diagnostic paper (1). The sample is drawn up to tiny wells (2), where it reacts with embedded chemicals (3). The test could become a cornerstone of telemedicine, allowing diagnoses from afar (4).



TRANSPORTATION: FLYING DUNE BUGGY

INNOVATOR: Steve Saint; I-TEC

BRILLIANT IDEA: The first useful flying car, which will soon carry medicine and supplies to remote settlements in the Amazon.

STEVE SAINT, 59, GREW UP in Ecuador in a family of missionaries, spending his summers in a Huaorani village in the Amazon. A decade ago, he started the Indigenous People's Technology and Education Center (I-TEC), an "engineering ministry" based in Florida. Then Saint, who is a pilot, decided that I-TEC would build a flying car. (See "The Mission," May '09.) This is a field where dreamers can fruitlessly waste years, but Saint was confident that his machine would help the Huaorani get around their largely roadless world of rain forests and rivers. Now, it's ready. Powered by a 128-hp engine, the 1100-pound Maverick can go 80 mph on pavement and then keep rolling over dirt tracks. When the road ends altogether, the pilot hoists a parachute up a carbon-fiber mast and shifts into flight mode, shifting power from the wheels to a five-bladed propeller in back. The Maverick can replace a days-long hike for medical help with a half-hour flight. Saint, who plans to start selling Mavericks within a year, sees users beyond the Amazon: "We're looking at the end-of-the-road marketplace—pipeline inspectors, ranchers herding cattle or checking fences." The key, he says, is to keep the Maverick simple. "If we're going to make this the Ford of flying cars, it has to be easy to fly."

PHOTOGRAPHS BY BRAD DECECCO; DIAGRAM BY DOGO

ROBOTICS: VERSATILE SPHERE

INNOVATOR: Greg Schroll
BRILLIANT IDEA: A ball-shaped robot that can roll uphill—and may one day explore other worlds.

NEXT
GENERATION
AWARD

WHEN HE WAS A KID, Greg Schroll used to daydream about a soccer ball that could redirect its course while rolling. As a mechanical engineering student at MIT, he built a spherical robot that can do just that. Other spherical bots roll as a result of a pendulum inside that constantly shifts the sphere's center of mass. But that design is limited, Schroll says. "Most people have a disclaimer saying their spherical

robot can't climb steep inclines or stairs. My goal was to overcome that limitation."

That was a big challenge for an undergrad, but Schroll, with his father's help, had already tackled an array of impressive projects before finishing high school, including an all-terrain tracked vehicle and a pressurized-air howitzer that he used to pulverize pumpkins against a backstop in his Chatham, N.J., backyard. The key to build-

ing his new bot, Schroll decided, was a set of gyroscopes that would store momentum before reaching an obstacle.

At MIT's famously well-equipped Hobby Shop, Schroll used an abrasive water-jet machine to cut aluminum and steel parts for his prototype. He plundered parts from radio-control helicopters and cars and, for an outer shell, repurposed an 18-inch gumball-machine globe from the Wizard Vending Co. For traction, he attached rubber strips from a playground kickball. The result was a remote-control ball that could navigate steep, rugged terrain, even from a dead stop. Ken Stone, director of the Hobby Shop for 18 years, calls Schroll the best student designer and builder he's ever seen. "MIT's motto is 'Mind and Hand,' and the school's success has been all about people with that ability to build—to bring an idea to reality," Stone says. "Greg is the embodiment of that idea."

Now a grad student at Colorado State University, Schroll is enhancing his bot with sensors, including an inertial measurement unit typically used in airplanes and guided missiles. He envisions the technology being used to explore everything from alien planets to hazardous waste sites. Since the outer shell is a continuous surface, it could be made impervious to harmful chemicals or hermetically sealed and made to float in water. "One of my fantasy ideas is to build it with enough suspension to allow it to be air-dropped," he says. "I imagine a cargo plane dumping 1000 of these spherical robots. They wouldn't need any landing equipment. They'd bounce and start collecting information."

Inside Greg Schroll's robot, two drive motors turn gyroscopes to produce motion. The motors come from remote-control cars. July 30 in Fort Collins, Colo.

CREG

PHOTOGRAPH BY JOHN CLARK

ENGINEERING: INSPIRED PROBLEM-SOLVING

INNOVATOR: Dean Kamen*

BRILLIANT IDEA: Transform medical technology while amassing more than 440 patents—and then remake American culture, one future engineer at a time. (About 42,000 kids competed in Kamen's FIRST Robotics competition in 2009, which culminated in a World Championship event in Atlanta's Georgia Dome.)

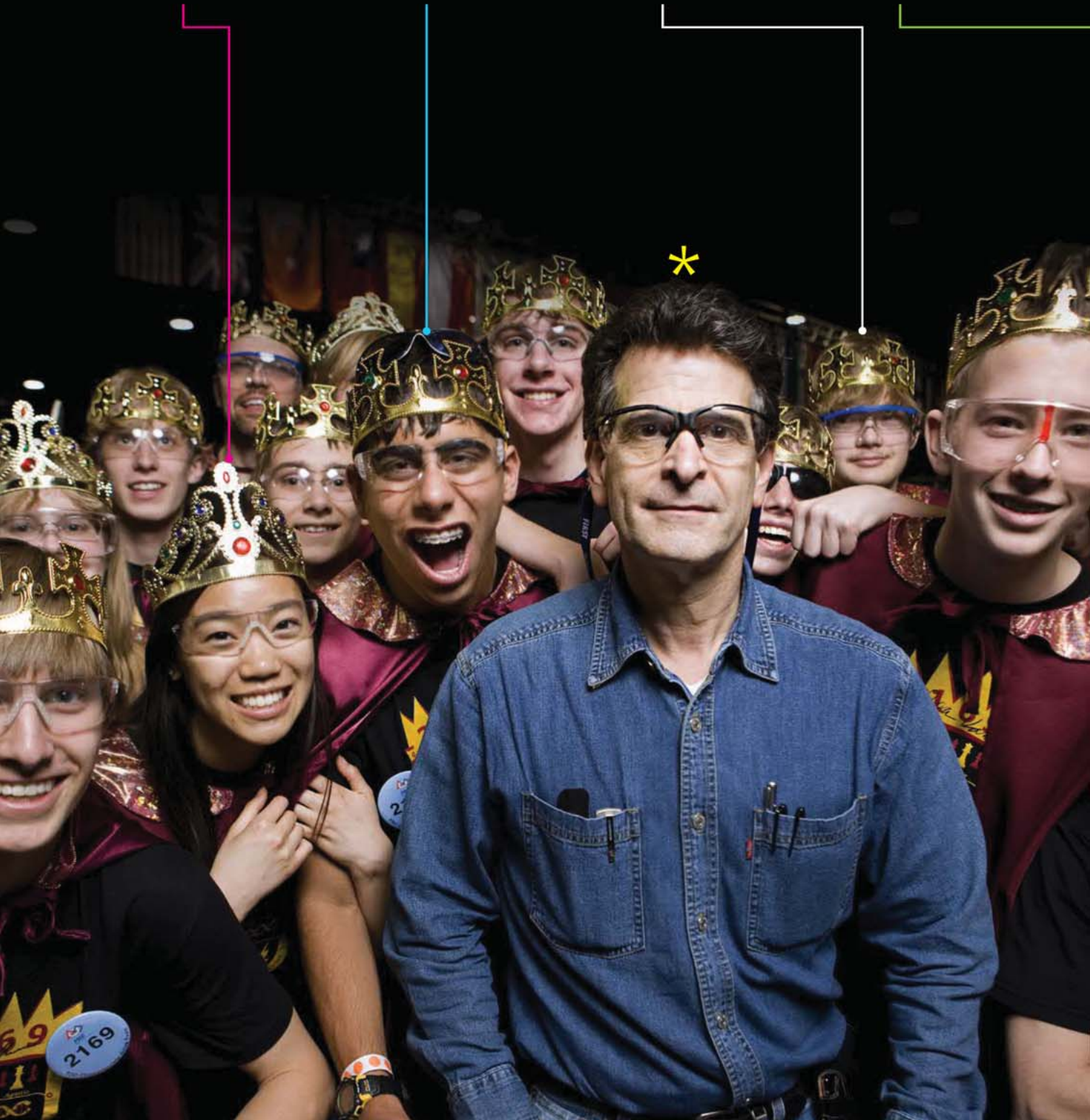


Leads Mars mission, 2035.

Helps cure cancer, 2027.

Perfects fusion power, 2039.

Builds 400-mpg roadster, 2023.



'09

breakthrough awards

Dean Kamen's first visit to a machine shop was a revelation.

He was too young to drive, so he bummed a ride. The smell of oil, the glistening equipment, the grinders throwing sparks—so this was how precision parts were made. When Kamen started his first company, while still in high school, he outfitted his own machine shop in his parent's basement. "Each time I bought a tool," he says, "I extended my capability to do something, to make something."

He certainly did. While still an undergraduate, Kamen created the first wearable infusion pump to steadily deliver vital drugs, reducing the time patients were confined to hospitals. Among his inventions are a portable kidney dialysis machine for use in patients' homes, the iBOT wheelchair (which can climb stairs), a futuristic prosthetic arm and the Slingshot water purifier to improve health in impoverished parts of the globe. In 1989, Kamen founded FIRST (For Inspiration and Recognition of Science and Technology), a high-energy robotics competition for teens. "My greatest invention," he says, "is helping create thousands of new inventors."

Along the way, Kamen fulfilled any kid's dream of life as a modern Edison, with helicopters and airplanes that he pilots himself, a private island in Long Island Sound that jokingly seceded from the United States and a high-tech company with about 200 employees, housed in a beautiful 19th-century textile mill fronting the Merrimack River in Manchester, N.H. POPULAR MECHANICS editor-in-chief Jim Meigs and deputy editor Jerry Beilinson joined the inventor in the office of DEKA Research and Development to discuss innovation, Kamen's hope for the future of America and his hands-down favorite piece of technology ever.

PM: Can you remember the first time you used a tool?

DK: No, I can't. I guess as a kid I was more of a born physicist than an engineer. I remember thinking about how a ball bounces—very predictably. On each consecutive bounce it goes a little less high until it stops. It never is sitting there and suddenly starts to bounce and gets higher and higher. Why? So many things in the

world at first appear mysterious, and then you start to see general patterns. And I realized there must be some rules and that they're comprehensible. I later decided that's what physics is all about—giving me the rules of the world.

PM: As a teenager, you had a company that made audio-visual controllers. Did the customers know you were in high school?

DK: No, no. And we worked hard to keep it that way. My younger brother would bring his friends over after school and they'd solder circuit boards down in the basement. My mother would send out invoices.

PM: How did you go from that to medical devices?

DK: My older brother would come home from med school, and his focus was pediatric hematology and oncology, which is essentially taking care of little babies with leukemia. It's not a happy thing. He would come into the basement and say, "You know what I really need? I can't deliver the right amount of a drug because all the equipment that we have in a hospital is sized for an adult."

So I made a little precision device. I did this for maybe two, three years. My day job was making money doing the audiovisual stuff, and on the side I'm building medical equipment for my brother. Remember, these are the days before the Food and Drug Administration had authority over medical devices. I just made this thing, and my brother would go into the hospital and do experiments.

PM: Eventually, though, that device did become a business, once you adapted it to deliver

Dean Kamen with the KING TeC robotics team from Savage, Minn. The Georgia Dome, April 15.

a steady dose of insulin to diabetics.

DK: So you go from childhood leukemia, which we hope remains one of the rarest conditions in the world, to the most common chronic disease state where you need continuous infusion of a drug. Suddenly, boom—we might help define a whole new generation of ways to treat chronic disease.

PM: Could some kid today do what you did—invent a medical device?

DK: Some parts of it are frankly much easier to do and some parts are harder. The technologies are easier because there's such a huge amount of technology on the shelf. There's almost no amount of computation that's not available at a very low cost.

The irony of that is that society has become withdrawn and nervous about technology, about change, about the future. Whether it's terrorism or the swine flu, people are way more risk-averse than they ever were before.

I mean, there was a time when most people thought you could do whatever you wanted

except extraordinary things where you better go check. We now live in a world where little kids will walk by the river outside my window and say, "Are we allowed to touch the water?" You know, they go to a playground and say, "Are we allowed to use that?" I think we live in a world where everybody is looking for some authority to give them permission to do anything, including think.

PM: What's your opinion of the debate over healthcare?

DK: I'm very worried that the entire debate is misguided. I mean the whole supposition: "We have a crisis in healthcare." Our healthcare system is developing incredible devices to improve the quality of people's lives. We're developing pharmaceuticals that alleviate the need for surgery. We're making the surgeries that are necessary ever less invasive. If we have a crisis, it's the embarrassment of riches.

PM: But how about rising costs and concerns about healthcare being rationed?

DK: Each side of this debate has created the boogeyman

and monsters like "We don't want to let this program come into existence because that will mean rationing." Well, I hate to tell you the news, but as soon as medicine started being able to do incredible things that are very expensive, we started rationing. The reason 100 years ago everyone could afford their healthcare is because healthcare was a doctor giving you some elixir and telling you, you'll be fine. Of course we ration today.

PM: So what's the answer?

DK: The way to ration less is to make more good technical solutions. Diabetes alone, if you include all of the long-term, insidious consequences, is responsible for about 30 percent of the federal reimbursement for healthcare. But what if tomorrow we could wipe out diabetes? I'm sure in 1920 if you asked actuaries to say what percentage of our GDP are we going to spend taking care of people with polio, they'd say: "They'll sit in iron-lung machines their whole lives with three people watching over them. We can't support them all." But what

did it actually cost to deal with polio? Oh, \$2 apiece. We gave them the Salk vaccine.

If you want to sit here today and project forward these horrific costs of treating everybody and you want to assume we are not going to make therapies and cures better, simpler and cheaper, well, you know what? We might actually get to that being the situation—if we stop investing in technology, if we stop believing that the future ought to be better than the past. I think this debate shows a fundamental lack of vision, a lack of understanding of what's possible.

PM: In 50 years, what will be considered your biggest contribution?

DK: That's easy. FIRST.

PM: Why?

DK: What's the most practical way to ensure you'll have great inventions? What would you want to invent? Inventors. At a FIRST event, you look up at the stands at the Georgia Dome, you're looking up at thousands of opportunities to do something unbelievable. You think, one of these kids is going to make some engine that doesn't pollute, one of these kids is going to cure some kind of cancer.

The Adventures of Dean Kamen, Inventor

1967

Late at Night, and Without Permission ...

Kamen, 16, works at New York's Hayden Planetarium; secretly installs his homebuilt controllers.

1971

Freedom From Hospitals, I

His brother, a med student, wants better drug delivery technology for babies. Kamen invents a precision infusion pump. It also lends new freedom to diabetics.

1972

Underground Movement

Kamen's company is cramped in his parents' basement on Long Island. He sends them on a trip, jacks up the house and excavates a bigger work space.

1982

"Live Free or Die?" Cool

Inspired by the motto on New Hampshire license plates, and the proximity of "trade school" MIT, Kamen moves to Manchester.

1986

Carbon-Neutral Isle

Kamen buys 3-acre North Dumpling Island. He "secedes" and adopts a flag, alt-energy systems and money in units of pi.

PM: FIRST requires hands-on problem solving as the kids design and build their robots on a deadline. Is there enough hands-on learning in schools?

DK: Most of what kids get in school is at a pretty high level of abstraction, especially in math and science. Imagine if we said it's important for kids to really love and get involved in some critical skill—like football. So we'll make a football curriculum. At five or six years old we'll show them pictures in a book. The next year we'll explain some of the rules, and give tests on them. And this will go on for eight or 10 years before they're ever allowed to touch the ball or play the game. You'd say, "Well, Dean, nobody would do that. That's idiotic." Really? That's the world of engineering. At five or six years old we teach kids what the numbers look like. Then we test them on adding and subtracting. By the time they're 17 years old, and you say, "Have you ever used trigonometry to do anything in your life, ever? Ever?" And they'll look at you.

This is a really bad time for this country to sit back on its

laurels. Because this is the first time in global history that we are creating a village that will be a meritocracy. I happen to think that's great. And if we want to continue to live in a place that's the envy of the world, we better redouble our efforts to get all of our kids on the varsity team of thinking and creating.

PM: What do you love about flying your helicopter?

DK: I love everything about flying a helicopter. The physics of a helicopter, the aerodynamics of it, the mechanical gizmo-ology of this organized bucket of bolts to me is fascinating beyond almost any single machine. And then when you add that you put yourself inside it and literally wear it—you don't

really fly it. When I was a little kid I always thought how cool it would be to just get in a helicopter and cheat gravity, leave from your own house, go to your own building. And now I'm sort of living that dream. And after doing it now for decades, I gotta tell you, it doesn't wane. Every time I get into that helicopter and pick it up off that pad and just hang there for a moment and spin and feel like I'm cheating gravity, I get the same rush of adrenaline I got the first time I flew.

PM: What do you think of science fiction as a way to inspire kids?

DK: Most kids are intimidated by science, but they seem to all love science fiction. You know what the difference is between

science fiction and science? Timing. Every generation turns the science fiction of their grandparents into the science of their generation. You want to know where the world is going to be? Look at good science fiction.

PM: Did you have a favorite science-fiction tale?

DK: I was always especially fascinated by one concept in science fiction, and I'm afraid it's the only one where I'll see very little progress in my lifetime—the time machine.

PM: If you did have a time machine, what would you do?

DK: I'd go back so I could understand how people thought and why they did what they did as they evolved ideas. I'd go forward to answer questions that I'm desperate for answers to, answers that I know will be trivial, common knowledge in 50 or 100 years. But mostly, whether I was going forward or going backward, I'd know that I have all the time in the world to learn it all. Because I'd keep myself somewhere in that space before the forever of not being here anymore.

Dean Kamen, engineering rock star, at FIRST Worlds.



1992

Making Robotics a Contact Sport

Kamen holds inaugural FIRST robotics competition with 28 teams in a high school gym.

1993

Freedom From Hospitals, II

Kamen's company, DEKA, unveils a quiet, 22-pound home dialysis machine, freeing kidney patients from hospitals while keeping them healthier than before.

1999

Beyond the Wheelchair

The iBot, a stair-climbing, robotic "mobility system," begins clinical trials. (Kamen uses similar technology to build the Segway.)

2007

Sci-Fi Prosthetic

Kamen debuts the highly versatile, DARPA-funded Luke prosthetic arm. (A three-year Veterans Affairs trial begins in 2009.)

2008

Rx for Thirst

The Slingshot, powered by a Stirling engine and meant for developing countries, uses vapor distillation to purify even the rankest water.

2009 BREAKTHROUGH PRODUCTS

BRILLIANT INNOVATIONS—most of them, at least—make their greatest contributions once they become products people can buy. This year's winners trim energy use, enhance communication and just make life more fun.

HONEYWELL WIND TURBINE

Noise, bulk and inconsistent winds have hampered the adoption of wind turbines by homeowners, but a new design could change that. Imad Mahawili, a chemical engineer and long-time wind-energy consultant, has reimagined the technology to take advantage of even light breezes. In a typical wind turbine, air moves the blades, which turn gears to spin a generator and produce a current. Those mechanical linkages siphon off a good deal of wind energy before it can be converted to electricity. Mahawili's system, the Honeywell Wind Turbine, eliminates the separate generator, and therefore the gearing. The blades are tipped with magnets and enclosed in a wheel that contains coiled copper—in other words, the turbine itself is the electrical generator. With conventional designs, "It takes 7 to 8 mph to overcome the resistance of gears," Mahawili says. The new system, which weighs 165 pounds and costs about \$5500, works in 2-mph winds.



From left: Honeywell Turbine, Palm Pre, Hustler electric mower



PALM PRE

The Palm Pre (which costs \$200 with a contract from Sprint) doesn't break ground with any one engineering advance. Instead, it sets a new standard by putting all the best available technologies together. Most cellphones—even high-end ones—excel at some tasks, while utterly ignoring others. The Palm Pre's features read like a gadget geek's wish list:

optional inductive charging, a full keyboard, the ability to sync with iTunes—and it can run multiple applications at once. Sometimes more is more.

QUIKRETE ASPHALT COLD PATCH; GREEN CONCRETE MIX

Every year about 45 million tons of old asphalt get torn up and pulverized in the U.S. Most of it winds up in landfills. Meanwhile, 81 million tons of fly ash and slag are produced as coal is burned in power plants. Quikrete has started putting that waste to work in DIY construction supplies. By using recycled roadway material in its Asphalt Cold Patch and coal-burning byproducts in its Green Concrete Mix, the company is saving energy in its own factories while helping to clean up other people's messes.

HUSTLER ZEON

The Hustler Zeon, the world's first all-electric zero-turn radius mower, shows what an environmentally friendly piece of yard machinery can do. The four 12-volt lead-acid batteries power twin DC deck motors, driving a pair of blades for a 42-inch-wide cut. The batteries also power twin AC hydrostatic drive motors, one at each rear wheel. The machine can turn on a dime or zoom along at 6 mph. The run time is 80 minutes, long enough to cut an acre. The Zeon costs about \$7000.



It's the guru of directions. Your voice is the navigator.



TURN-BY-TURN DIRECTIONS

JUST ONE OF THE MANY AMAZING FEATURES FROM SYNC[®],
THE VOICE-ACTIVATED IN-CAR TECHNOLOGY AVAILABLE
EXCLUSIVELY ON FORD, LINCOLN AND MERCURY VEHICLES.*

SYNC. Say the word.

hands-free calling • music search • vehicle health report • **turn-by-turn navigation** • business search • 911 Assist™ • real-time traffic • audible text • my favorites

Learn more about all nine SYNC features at syncmyride.com

*Driving while distracted can result in loss of vehicle control. Only use mobile phones and other devices, even with voice commands, when it is safe to do so.

LOGGERHEAD BIONIC HYDRANT WRENCH >>

The five-sided nuts on fire hydrants are rarely a uniform size, and parallel-jawed adjustable fire wrenches can't grip the fasteners. LoggerHead Tools' new, one-size-fits-all wrench surrounds the fastener with five jaws. Start rotating the tool and the jaws close in on each facet. The wrench, which also comes in hexagonal and square versions, will allow firefighters to open any hydrant fast.

ANDALAY AC SOLAR PV PANEL

Solar photovoltaic systems must be paired with inverters to convert the panels' DC power to the AC power used in homes. So installing a solar array involves sizing an inverter to fit the panels' output and running a bunch of wiring—not that easy. New panels from Andalay incorporate microinverters, along with racking and wiring—and take a big step toward true plug-and-play solar power for the home. Andalay says future products will be even easier to install.

BIONIC HYDRANT WRENCH



FORD ECOBOOST V6

Clockwise from left: LoggerHead hydrant wrench, Ford engine, Nikon micro-projector camera

Ford has built the first of a new breed of turbo engines designed to improve fuel efficiency. In the past, turbocharged engines have been used to boost power rather than save fuel. They ran at efficiency-killing low compression ratios and rich air/fuel ratios to prevent meltdowns. The 365-hp 3.5-liter EcoBoost V6 uses several tricks to overcome these limitations. For instance, the direct fuel-injection system squirts fuel into the combustion chamber instead of the intake ports—this cools the chamber, allowing for a fairly high 10.0:1 compression ratio. The new V6 debuted in the Lincoln MKT and MKS, and the Ford Taurus SHO.

LEHR PROPANE-POWERED ECO TRIMMER

Lehr founder Bernardo Jorge Herzer came to appreciate propane-powered small engines during his time as a ship captain

in the North Sea. The company's four-stroke string trimmer (also sold as the Craftsman Propane Line Trimmer powered by Lehr) produces far less pollution and is more convenient than the two-stroke gas-and-oil machines it can replace. "Propane is much safer, more efficient and more reliable," Herzer says. "That's why we used it in our ships."

TECHCRUNCH CRUNCHPAD

Tech blogger Michael Arrington wanted a low-cost tablet computer—something to handle basic Web-oriented tasks from the comfort of his couch. No company offered one, so he designed it himself. The Linux-based PC, which is edging toward release, is promising—but the best part is the proof that today a tech fanboy can take the director's chair and quickly prototype a smarter product.

NIKON COOLPIX S1000PJ

Microprojector prototypes started popping up two years ago, and it was clear from the start that their destiny was to become small and inexpensive enough to be built into other gadgets. Now, Nikon has notched a first: The tiny LED projector in its 12.1-megapixel, \$430 compact camera casts large, clear images onto a wall. This promises to resurrect the slide shows of earlier eras, without the hassle of actual slides. (Remember those?)



SOME DIAMONDS ARE
ESTIMATED TO BE OVER
A BILLION YEARS OLD.

THE ONES WE USE
IN OUR FAUCETS
ALSO KNOW A THING OR
TWO ABOUT DURABILITY.

Our DIAMOND™ Seal Technology uses a valve with
a tough diamond coating to bring you a faucet built to last
up to 5 million uses. Who knew a faucet could be just as
beautiful on the inside? It's one of the many ideas
that make Delta® more than just a faucet.



see what Delta can do™

LELAND®

deltafaucet.com/dstfaucet

Working

In

Stone

BY ROY BERENDSOHN

PHOTOGRAPHS BY
BRAD PARIS

BASALT AND
SCHIST INSPIRED
CENTURIES OF
NEW ENGLAND
GRUMBLING—AND
ARTISTRY. BUT
WORKED WITH
STEEL, MUSCLE
AND HEART,
ROUGH-HEWN
ROCK CAN ALSO
BECOME A GIFT.



Roy

To build a bench, the author placed each hand-shaped stone, then trimmed away the excess mortar.

When I was growing up in New England, it seemed there was always a rock lurking just below the ground's surface. It frustrated the smallest job, like driving a tent peg, and often sabotaged larger projects, from digging a posthole to planting a shrub. Wherever this schist and basalt surfaced like a shark fin, it ruined everything that touched it, whether that was a mower blade or your shin.

The only good way to deal with a rock, in my opinion, is to pry it out of the ground and use it to build something. That's how you get even with it—put it to work.

I learned that lesson early at my dad's side. He was an engineer, a born builder. We had just moved to rural Connecticut in the late 1960s, and our furniture was barely out of the moving van when he started digging up rocks and extending the house's retaining walls.

We also made rock, after a fashion. Mixing and placing concrete, my father, my brothers and I

built walks and made foundation slabs. Some of my first memories go back to mixing concrete with my dad, when I was so small all I could do was pretend to help. In the 1960s and '70s, fathers and sons had time for these things.

My dad, a widower, still lives in the house where I was raised, surrounded by our construction projects—among them a walkway, a patio and a shed I built when I was 16. When he turned 85 recently, there wasn't much I could buy him, so I decided to build something as a gift. That would be fitting.

Laying a Foundation

I've always been fascinated by stonework, from elegant limestone-clad office buildings to Pennsylvania farmhouses with walls neatly laid up with rock from the fields nearby. But, oddly enough, I've hardly constructed anything from stone since I was a kid—concrete block and brick, sure, but not natural stone. My first thought was to build my dad an outdoor stone fireplace that I found in an old issue of *POPULAR MECHANICS*. But the more I studied the drawing, the more I realized how out of place it would look in his backyard. It was massive, suited to big, late-night barbecue parties. The yard was a contemplative spot, shaggy with shrubs that my father had planted when I was a boy. Besides, he already had a small charcoal grill that he was quite happy with. A rustic stone bench would be more appropriate, I thought.

I took my dad out to a local diner to discuss the idea—it was the same place where we'd hashed out long-ago plans over plates of meatloaf. He sat across from me, quietly surveying the menu. "You know," he mused, "this place makes the best whiskey sour around." After a pause, he asked, "So tell me, what do you want to build?" "Simple," I said. "A stone bench. Two pillars and a seat." "Sounds good," he replied. Permission granted.

On an unusually cool summer morning, I drove out to Swenson Granite Works in Newtown, Conn. When I was a kid, you bought stone at a quarry or a masonry yard, places with a massive truck scale outside the office window. Dust devils would swirl by as you shouted above the roar of rock crushers and front-end loaders. The Swenson yard was neat and quiet. I struck up a conversation with John Doherty, the assistant manager. "This is nice stuff," I said, admiring a silver-flecked

slab of granite trucked down from Barre, Vermont. "It's the only permanent building material," he said. "It'll be here long after we're gone." The beautiful slabs were cut with a furniture-like precision and crisply stacked. Flanking them were pallets of fieldstone wrapped in wire.

I had already decided to build the legs, or pillars, with rustic stone reminiscent of the stone walls that trace the hills of southern New England. Now, for the seat, I had to choose between the granite and less-formal blue stone. I decided the blue stone would be more in keeping with my dad's yard, and



the
MAKING OF A BENCH

1. The bench's foundation is a pair of 4-inch-thick concrete footings. I penciled each pillar's square footprint onto a footing. Then came mortar and, finally, the first rock, carefully pressed into place.

2. Rocks can be cut to shape with a tracer. The tool cuts a line across a rock's face, and then the rock is split along the line. The next rock that abuts it may fit

unaltered, or it may need to be cut to shape. The process creates a pile of stone chips and debris.

Useful pieces, stored in a bucket, can be employed later as the pillar rises.

3. Masons keep a torpedo level in their back pocket and pull it out frequently to check their work. Rock is irregular, and it's easy for a pillar to go out of plumb in the course of construction.





- 1.** The trick to “rocking” a slab’s edge is to hold the tracer at an angle and strike it sharply with a hand sledge. One hit per cut is all it takes.
- 2.** A trowel full of mortar went atop each pillar. The seat quickly settled into level with a few taps from the tool.
- 3.** The bench sits between the shed and patio I worked on 30 years ago.



July 1938

This PM project reflected the era's rustic architecture.



1

2



3



ordered that, plus rock for the pillars. I signed on the dotted line for delivery. Then, before I left, I bought a pair of chisels—a point and a tracer, both from Trow & Holden, a legendary New England company. The point breaks off high spots and roughs stone to shape; the tracer splits more precisely.

Back at my dad's, I hammered together two forms for the pillars' concrete footings and dug them in, hitting rocks with every jab of the shovel. Next came the footings themselves. It always feels good to mix concrete. I was working over the first footing when I heard the screen door close. "Did you strike off the excess with a piece of lumber?" my father asked. "Just like you taught me when I was 12," I replied. I remembered the lesson: Overfill the form, push the concrete down and consolidate it, then strike off the excess in a sawing motion with a 2 x 4 held on edge. Finish it with a float, which is nothing more than a piece of wood with a handle. That smooths cement paste and sand that have been worked (or floated) to the top. My dad nodded and left for a meeting of a volunteer group he chairs. He's got a lot on his plate for a guy his age.

I mixed and placed the concrete for the second footing and had just begun floating it when there was a squeal of air brakes and a backup horn from out front. If you want materials delivered, just start floating a piece of concrete. Works every time. I jogged out front to take the delivery of stone, and the driver neatly deposited the load using the truck's hydraulic arm.



Building Pillars

The fireplace plans that inspired the bench were published in PM in 1938, when rustic architecture was popular, especially in the cabins and visitor centers built in national parks before World War II. The masonry was deceptive—seemingly untutored, actually sophisticated. Like the Arts and Crafts woodworkers of the same period, rustic builders were trying to evoke an earlier time, before the era of mass production.

That seemingly primitive look is what I was shooting for in my dad's bench. I hauled a heap of stone into the backyard, dumped each load, sorted it, wire-brushed away mud and stacked the material by size and shape. I cracked big stones in half with a stone hammer and split off lumps using the chisels. I dry-stacked the first pillar, stone by stone, pausing occasionally to look at it from various angles. When it was done, I stood back and gave it a long, hard look. It was awful.

A properly placed stone looks like it "belongs," according to *Stonework Techniques and Projects*, a book by mason Charles McRaven that I'd been consulting. None of my stones looked like they belonged there, or anywhere.

I started over. Having learned a few things, I did better this time around. I mixed my mortar and slowly laid up the pillar. It was a bit rougher than I'd planned, but serviceable. Work on the second pillar came more easily until close to the top, when I couldn't find the right stone for a tricky corner. My father came by to check on me. "Here," he said, handing me a stone, "try this one." It was too small. "Too much mortar would show, dad," I said gruffly. I felt bad as soon as I said it. "Well, try this one, then," he offered. I was relieved I hadn't hurt his feelings. With a little chisel work, the stone made a pretty good fit, and my dad shot me a look as if to say, "See?" A few more stones and the pillar was finished. All that was left was to add the blue-stone seat, a job I'd tackle on my next visit.

Yellow leaves were mingled with the summer's foliage by the time I got back up to my dad's. Before installing the seat I wanted to chisel a bevel into its edge, using a technique known as "rocking" that leaves a more natural look. I started slow, setting the tool with two taps, then beveling with a third firm strike. After finishing one edge, I felt confident enough to flip the slab and quickly rock the other side with solid, single blows.

There was a half-bag of Type S mortar left, and I mixed up a couple of shovels' worth. The right-hand pillar was a bit shorter than the left, and from the mound of leftover rock, I found a perfectly flat shim to top it off. I placed the mortar on both pillars. Then, with a ceremonious flair, my dad pushed the shim rock into place. With the assistance of a young helper I'd enlisted, I set the seat across the two pillars. The bluestone settled nicely, and just a couple of taps with the butt of the trowel handle got it dead on. I looked over my shoulder at my dad, who was intently studying the level's bubble. "Not bad," he said. "Not bad."

PM

Mileage Masters

→ WE TEST AMERICA'S MOST FUEL-FRUGAL CARS—

→ By Ben Stewart

→ Photographs by Declan Thomas



AUDI A3 TDI

TOYOTA PRIUS V

SMART FORTWO PASSION

➔ **Forget about horsepower**, dragstrip time slips or torque curves. The most important automotive performance yardstick of the next decade will be miles per gallon. Gyrating fuel prices and a cratered economy have made car buyers more concerned about fuel economy than ever. "It's definitely one of their top factors in a purchase decision," says Mike Omotoso, senior manager of powertrain forecasting for J.D. Power and Associates.

But regardless of what consumers want, new Corporate Average Fuel

To represent the hybrid camp, we selected the Prius, the Ford Fusion Hybrid and Honda's new Insight. The Audi A3 TDI carries our diesel baton, and Smart's precocious Fortwo—the only car with a plain-vanilla gasoline engine—blazes a trail for other minicars to follow.

We put these vehicles through a grueling two-day marathon over two routes—220 miles of city driving and 320 miles on the highway—to represent how they would perform in typical conditions. Later, we ran each one through our tests at Auto Club Raceway in Pomona, Calif. Once the hard numbers were logged, we tackled some curvy roads, just for fun. Since these cars meet vastly different driving priorities, we judged each on how well it fulfills those duties, rather than ranking it against others in the test group. Here, we present a cross section of the most efficient cars in America.

Economy (CAFE) legislation signed in May will force manufacturers to improve their fleet fuel economy by 5 percent each year, from 27.3 mpg in 2011 to 35.5 mpg by 2016. So automakers will need some superstar sippers. We gathered five of today's most fuel-efficient cars—ones that would easily clear the 2016 mandate—to find out if they blend that efficiency with comfort, power and daily driveability.

DO THEY MELD EFFICIENCY,

PRACTICALITY AND DRIVING FUN?



HONDA INSIGHT EX NAVI



FORD FUSION HYBRID

2010

Honda *Insight*

→ **Honda, like its** crosstown rival Toyota, was ahead of the hybrid curve. Ten years ago, the Honda Insight, with its streamlined body shell and 70-mpg rating, was the first hybrid car to hit American shores. But with only room for two, it sold in limited numbers. For 2010 the Insight has returned as a true Prius competitor. The aerodynamic four-door hatchback mirrors the profile of the Prius, a shape that proudly says "dedicated hybrid." Yet the Insight's price undercuts the Toyota's. One reason is Honda's much simpler hybrid system: A 13-hp

electric motor is sandwiched between the 1.3-liter engine and the CVT. The Toyota uses a larger battery pack, a planetary gearset and a higher-torque electric motor that can move the car independently of the gas engine. Unlike the Toyota or Ford hybrid systems, the Honda does not allow prolonged electric-only operation, because the little electric motor just doesn't have enough juice. However, the Insight switches to electric-only power when cruising at low speeds. In that case, the VTEC system idles the valves, so the engine still spins, but it doesn't consume any fuel. Yet the gas engine must start at stoplights to power the air conditioning. So if you select Eco mode, you

have to forgo a/c when stopped. We ran in this mode during our testing, and though the cabin did get hot, we were able to generate a solid 45.3 mpg on the city loop. The Insight rides a bit rougher than the Prius, and doesn't feel quite as polished or upscale. As a featherweight, it does struggle to maintain a consistent heading on freeways with high crosswinds. Around town, the Insight feels sporty and light on its feet as it jousts through traffic. There's an honest simplicity to the Honda—like a Civic from the 1980s, the Insight feels tight, as though it would run reliably for decades.

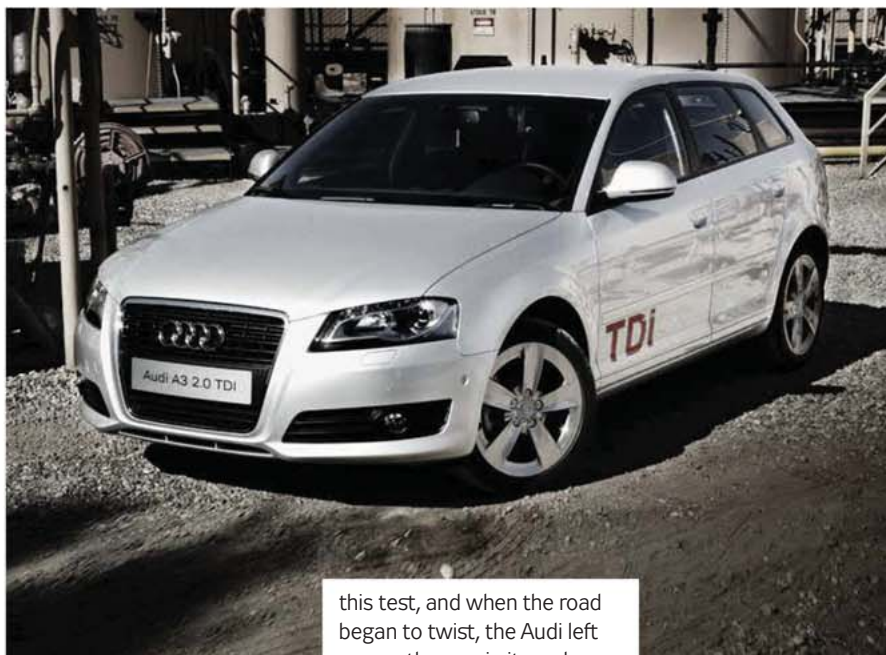
The Insight mirrors the fuel efficiency of the more expensive Civic Hybrid. An economy coach on the instrument cluster glows green at maximum efficiency.



2010

Toyota Prius

→ **As beloved as** the previous-generation Prius was, it offered a rather bland driving experience. The steering felt just as digitally distant as a Wii controller. This all-new model is vastly improved. On our handling test course, the Prius felt crisp and, dare we say, even fun. On the highway, however, the Prius was buffeted a bit in strong crosswinds. When it was time to load our test gear, the Prius's practical hatch provided plenty of room—almost 40 cubic feet with the seats folded. The powertrain employs a pair of electric motors and a planetary CVT linked with a new 1.8-liter gas engine packing more torque. And there's even a dash-mounted EV switch that provides about a mile of electric-only range. Inside, our Prius was loaded with cool tech, including radar-based cruise control and lane assist. In the city, the Prius returned an incredible 52 mpg; on the highway, it bested the rest once again, delivering 46.4 mpg. When fuel efficiency is the sole criterion, no other vehicle sold in the U.S. can match the Prius. It's the fuel-economy champ.



2009

Audi A3 TDI

→ **Few vehicles combine** sporty handling, luxurious amenities and exemplary fuel efficiency in one package, but this new A3 TDI does just that—and does so with a satisfying rush of torque. The U.S.-spec A3 TDI will come with the same 2.0-liter 140-hp diesel that has made the VW Jetta TDI such a blockbuster hit for Volkswagen. Our A3 was a 2009 Euro-spec model (2010 U.S. production models go on sale in December), so it had an even more powerful 170-hp version of this engine under the hood. The motor is paired to Audi's brilliant six-speed Direct Shift Gearbox (DSG), which performs brisk shifts. Slide behind the wheel and it's clear this is a hip German sport wagon. The seats are comfortable and supportive, the materials are all soft to the touch, and the dimpled-rim steering wheel feels as good as the ones in Audi's top sport sedans. The A3 was one of the quickest in

this test, and when the road began to twist, the Audi left every other car in its wake. The steering is delicately precise and provides organic feedback matched by none here. But don't let the sporty moves fool you—this Audi is a formidable commuter. In the city loop, the A3 couldn't quite match the hybrids or the Smart in fuel efficiency. But on the open road it returned 42 mpg—only a few ticks behind the Prius. And that's the beauty of this Audi: It makes precious few compromises. You can have exemplary fuel efficiency wrapped in a fun-to-drive package. At around \$33,000, this A3 TDI is a bargain.

▶ The A3 TDI is as rewarding to drive on twisty roads as VW's sporty GTI. So, as a practical, fuel-efficient and hip European wagon, the Audi has few rivals.



▶ The Prius cheats the wind to improve freeway efficiency. Its Cd of 0.25 is the lowest of any car today.



2010

Ford Fusion Hybrid

The Fusion Hybrid combines sharp sheet metal and a comfortable ride with nearly 40-mpg fuel economy. Impressive.

→ As much as we appreciate the high-mileage chops of traditional dedicated hybrids, the Fusion proves that fuel efficiency doesn't necessarily require unconventional

wrapping. In fact, the Fusion looks and drives more like a regular midsize sedan than a hybrid. The Ford rides smoothly, absorbing big potholes like a luxury sedan. It's quiet, too, the most hushed in this group at speed. And it was this comfort level that made the Fusion our favorite to drive on the city loop, offering a serenity none of the others could match, along with 38.4 mpg—excellent for a sedan weighing nearly 2 tons. The powertrain is refined, several notches above the Fusion's price class. In fact, the transitions from EV mode to gas power are all but

SPECIFICATIONS AND TEST DATA

	AUDI A3 TDI	FORD Fusion Hybrid	HONDA Insight EX Navi	TOYOTA Prius V	SMART Fortwo Passion
Base price	\$30,775	\$27,270	\$23,100	\$27,270	\$13,590
As tested	\$33,000 est	\$31,940	\$23,810	\$33,079	\$15,205
Powertrain	140 hp/236 lb-ft 2.0-liter diesel I-4, 6 auto-manual	191 hp/136 lb-ft 2.5-liter electric hybrid I-4, CVT	98 hp/123 lb-ft 1.3-liter electric hybrid I-4, CVT	134 hp/105 lb-ft 1.8-liter electric hybrid I-4, CVT	70 hp/68 lb-ft 1.0-liter I-3, 5 auto-manual
Battery capacity (kwh)	N/A	1.4	0.58	1.31	N/A
Suspension (f/r)	strut/multilink	control arms/multilink	strut/torsion beam	strut/torsion beam	strut/solid axle
Wheelbase (in.)	101.5	107.4	100.4	106.3	73.5
Length (in.)	169.0	190.6	172.3	175.6	106.1
Width (in.)	69.5	72.2	66.7	68.7	61.4
Track (f/r)	60.4/59.3	61.7/61.3	58.7/58.1	59.6/59.4	50.5/54.5
Axle ratio	4.12:1/3.04:1	N/A	4.20:1	3.27:1	4.53:1
Brakes (f/r)	12.3-in. disc/11.3-in. disc, ABS, ESC	11.8-in. disc/11.0-in. disc, ABS, ESC	10.3-in. disc/10.3-in. disc, ABS, ESC	10.0-in. disc/10.2-in. disc, drum, ABS, ESC	11.0-in. disc/8.0-in. drum, ABS, ESC
Curb weight (lb)	3250	3780	2610	3010	1870
Tires (f/r)	225/45R17	255/50R17	175/65R15	215/45R17	155/60R15/175/55R15
Acceleration (sec)					
0–30 mph	3.72	3.54	4.35	3.65	4.68
0–60 mph	9.17	8.45	11.43	10.05	13.3
40–70 mph	6.82	5.67	8.8	7.8	11.5
Quarter-mile (sec/mpg)	16.76@85.30	16.24@89.98	18.29@77.24	17.37@81.0	19.10@71.40
Braking (ft)					
30–0 mph	33.75	33.63	30	29.7	31.6
60–0 mph	134.36	134.58	127.1	125.3	137.67
Sound levels (dBA)					
Idle	53.0	41.0	42.0	39.0	49.5
Full throttle	76.0	75.0	74.0	73.0	79.0
60 mph	65.0	61.0	64.0	64.0	67.0
Slalom (mph)	48.1	44.1	43.9	42.4	45.0
Lane change (mph)	59.4	52.3	55.5	53.1	56.1
Skidpad (g's)	0.80	0.73	0.73	0.78	0.67
EPA fuel economy (city/hwy mpg)	30/42	41/36	40/43	51/48	33/41
PM fuel economy (city/hwy mpg)	35.7/42.0	38.4/38.0	45.3/43.3	52.0/46.4	39.0/36.3

transparent. And the Ford was the quickest in this group. On the highway, the Fusion remained rock steady and tracked straight—no matter how severely the wind blew across the desert. But when the road began to bend, the Fusion wasn't a lot of fun. It had lazy responses and more body roll than the others. The Fusion rides and handles like the big sedan it is. Still, it's the first American hybrid that puts up serious mileage numbers. In fact, it delivered better highway fuel economy than the Smart. This is one clever fuel miser that doesn't have to shout about its eco credentials.

▶ The Fortwo is so tiny, we even parked our Smart perpendicular to the curb next to another Fortwo, just for fun.

2010 **Smart Fortwo Passion**

→ **On paper**, a car like the Smart makes sense for city commuters since it's about half the length of a large sedan. You practically look forward to parking in tight spots. So in close confines, finding space is easy. And from behind the wheel it doesn't feel as small as its exterior dimensions suggest—you could almost wear a 10-gallon hat in there. But the Smart has quite a few shortcomings. The doors and hatch are light and tinny. And

over rough pavement, the Smart is loud and rather crude. The minuscule, rear-mounted, 1.0-liter three-cylinder engine drives the rear wheels and produces an odd squatting of the suspension as you floor the throttle. It's paired to a lethargic automated manual that requires long pauses to perform shifts. At the dragstrip, the Smart is certainly slow. But on our city drive, it had just enough power to keep up and delivered a solid 39 mpg. Freeway driving isn't the Fortwo's forte. At

speed, the wake of an 18-wheeler easily jostles the tall and narrow body. And it requires constant correction to keep on course. It was the least enjoyable at freeway speeds by a wide margin. Yet, the Smart drew admiring glances. It's so cute and lovable you can't help but smile. Perhaps a case can be made for the Smart as a city-only car. But if your travels involve speeds higher than 55 mph, there are smarter choices.





HOME
THEATER
MADE
e-z

SURROUND SOUND WITH ON-SCREEN CONTROLS
STREAMING VIDEO SET-UP BOX
CONNECTED HDTV
KOPMELCHBRAND CODE: 13808LS

Blu-ray Discs - and beyond!

Superfast
240-HZ TV!

Stream HD Movies!!

THE
INTERNET IN YOUR
Living Room!

By Seán Captain

Packaging design by Jeremy Cook



HOME THEATER IS THE ULTIMATE PLATFORM FOR buyer's remorse. Formats change every few years, and in the past decade, the pace of that change has accelerated. Five years ago, 720p HDTVs were state of the art; now 1080p TVs have more than double the resolution. One high-definition disc format, HD DVD, was obsolete within two years of its introduction. So the market has long favored the procrastinator, since each new season brings equipment with improved technology at a lower price.

But prices—at least when it comes to TVs—have stabilized. “Seeing declines of 50 percent every year ... those days are gone,” says Paul Gagnon, an analyst with research firm Display-Search. Still, equipment remains fairly affordable. A 50-inch LCD starts at about \$1500; a comparable plasma, just over \$1000. Waiting to buy probably won’t save you much money.

Those who haven’t shopped for home theater gear in a while, however, will find that the technological landscape has changed in ways that are subtler, yet perhaps more important, than the hi-def revolution of the past 10 years. The key advances: embedded intelligence and connectivity. These affect the way televisions, gaming systems and video players get content and how they display it.

Change favors the educated buyer. Learning the new vocabulary of features may be daunting, but it will give you access to a world of unprecedented choice and convenience. From our experience with some of the most advanced AV gear, we’ve identified several trends to keep on top of as you bring your TV room into the 21st century.

TVs Get Smarter ...

Of all the changes occurring with home theater components, the new technology showing up in digital televisions may seem the most arcane. The language of HDTV has always been filled with confusing jargon, but much of the business about 480p, 720p, 1080i and 1080p that obsessed shoppers for the past few years essentially boiled down to a simple concept: Higher resolution is generally better. However, now that manufacturers are no longer just throwing pixels at consumers, they

have begun to develop more sophisticated technology to iron out the shortcomings of digital video.

LCD televisions, for instance, have a well-established difficulty in displaying dark shadows and blacks. LCD works by filtering a constant backlight, so there is often light leakage that can produce a muddy gray where pixels are supposed to be black. Newer sets are shifting to LED backlighting from previous fluorescent backlights. (LEDs are not an alternative to LCD; the two technologies work together.) LED LCD TVs come in two flavors: backlit TVs that place LEDs behind the screen and

HD was just the beginning. New screens and video gear change what we watch and how we see it.

POPULARMECHANICS.COM
NOVEMBER 2009

edge-lit models that pipe in light from the sides of the frame. LED-backlit screens can perform a neat function called local dimming, in which sections of the screen vary brightness to improve the black level. Edge lighting doesn't necessarily improve blacks, but it allows screens to get seriously skinny.

... And Fast Too.

A more nettlesome problem for LCD sets is caused by a trick of the eye that creates a perceived blur during fast-motion scenes. Other display technologies, including plasma, tube TV and even film projection, use rapidly flickering images. When the screen is dark between frames, your mind fills in the missing detail to perceive smooth motion. But LCD screens use a light source that is always on; most don't have a dark phase. So LCD makers such as LG, Samsung, Sony and Vizio generate the in-between details for you by displaying up to nine artificial frames. These sets are sold by frame speed: 120 Hz and 240 Hz. (Normal television video runs at 60 Hz, or 60 frames per second.)

The higher rates result in smoother video. But things can get a little weird when watching movies, which are

typically shot at 24 frames per second. In our test of a 46-inch Samsung Series 8000 model (\$3200), the familiar lustrous feel of cinema footage was transformed by the 240-Hz technology into crisp video that looked as if it came from an HD camcorder. Luckily, if you don't like the effect, you can turn it off.

Even though motion blur is less of a problem with plasma sets, Panasonic's Viera S1 plasmas (starting at \$1100) are also seriously speedy. The S1's 600-Hz subfield drive flashes pixels 10 times for every frame of video. A more important improvement: energy efficiency. Plasmas are well-known power hogs—many 40-plus-inch TVs draw more than 400 watts. But a 46-inch S1 is rated at an average 207 watts.

New Gear Gets Connected ...

To find the most transformative innovation in home theater equipment for the next decade, walk through your local Fry's or Best Buy, then turn the receivers, disc players and set-top boxes around and look for RJ-45 Ethernet jacks. The proliferation of these little connectors and their Wi-Fi antenna counterparts in home theater gear is slowly but surely opening the door to let the Internet into the living room.

This trend in connectivity has

spread to almost every category of audiovisual component, from game consoles to disc players, and it has spawned a new generation of set-top boxes and services specifically designed to deliver online content to your TV.

The cheapest and easiest to use of these networked boxes is the \$100 Roku player, which can stream about 12,000 movies and TV episodes from Netflix and 45,000 titles from Amazon's Video On Demand. Roku has also recently added access to Major League Baseball games and will soon provide commercial-supported programs.

Roku's services use streaming video, so the quality is limited by the speed of your Internet connection. Netflix, for instance, has a minimum requirement of 1.5 megabits per second, which is about the speed of an entry-level broadband connection. Most offerings are in standard definition. And even most HD movie titles, such as *The Curious Case of Benjamin Button* and *Casino Royale*, which we streamed from Amazon, don't look much different from standard-def DVDs because of a relatively low bit rate (the amount of video data transmitted per second).

Apple's contribution to the living room, the Apple TV (starting at \$229), allows for higher-quality video because content is downloaded to the device's hard drive before playing. The Apple TV's HD movies aren't quite Blu-ray quality, but a few feet back from the screen you'd be hard-pressed to notice the difference. All the download video services allow viewers to start watching a movie or show after just part of it has downloaded. For standard-def movies the wait is generally only a few minutes, but our tests showed that an HD movie over a slow connection can take more than an hour before it's watchable.

High-speed 240-Hz LCD HDTVs such as the Samsung 8000 series [1], the LG LH90 [2], the Sony Bravia Z-Series [3] and the Vizio VF551XVT [4] amp up television frame rates to fight motion blur.



A set-top box such as the Apple TV [1] or Roku Digital Video Player [2] is the easiest way to link your home theater to online services.



RETHINKING THE Remote



As home theaters and TVs become more like PCs, some device manufacturers have started ditching the standard remote in favor of a more computer-like onscreen interface.

But as manufacturers attempt to reach a consensus on the AV interface of the future, you're likely to encounter a diversity of controllers. Several models of Vizio TVs now have Bluetooth remotes with slide-out qwerty keypads.

Yamaha's NeoHD surround-sound systems (starting at \$600) opt for fewer buttons. The NeoHD receiver has no screen and comes with a simplified remote. The receiver creates virtual controls for all of your AV gear and displays them on your TV screen.

Or you could use the screen in your pocket. Bobby and Unify4life offer universal-remote apps for iPhones or BlackBerries and adapters that translate Wi-Fi or Bluetooth commands into infrared commands for AV gear.

... Current Gear Gets an Upgrade ...

The dedicated Internet video set-top box may prove to be merely a transitional technology, since many other products are embracing online video. Some devices you may already own can be upgraded via software to allow access to online video streams and downloads. TiVo digital video recorders (starting at \$300) can now access Netflix and Amazon and will soon provide streams from Blockbuster.

Owners of Sony's PlayStation 3 game console (starting at \$300) can add video capability for free. With an Xbox Live Gold membership (\$50 per year), you can use Microsoft's Xbox 360 (also starting at \$300) to rent HD movies and stream content from Netflix. And if you're willing to hook a computer directly to your TV, you can watch plenty of free shows and movies through online services such as Hulu.com.

One might think all this online content would be an argument against buying a Blu-ray player. But new Blu-ray devices from LG, Samsung and Sony are in on the online content game too. In addition to playing hi-def discs, these machines can access YouTube, Netflix and movie rental services such as Roxio's CinemaNow.

With the right TV, you could bypass all these machines and access online content directly. New connected TVs from LG, Panasonic, Samsung, Sony and Vizio can link to online information such as weather, stocks and sports scores through services such as Yahoo Widgets, plus stream video from sources such as Amazon, Blockbuster and Showtime.

Some TV sets from LG and Vizio can also play ultra-high-quality 1080p movies and shows from Vudu, a former set-top maker that now runs a streaming-video service. Vudu's HDX format is nearly indistinguishable from

Blu-ray in terms of quality—but it requires a fast Internet connection with a speed of at least 9 Mbps.

... And a Video Store Comes to Your Couch.

Most download stores charge \$2 to \$3 to purchase a TV show. Pricing for movies is more complicated. Some are sold (\$3 to \$20) and others rented (\$1 to \$5, with a limited time to watch before they expire). HD rentals are usually a few dollars more; pirating concerns mean few HD titles are for sale. A Netflix monthly plan of \$9 or more allows you to stream as much as you like, virtually all in standard def.

Online video offers the potential for instant access to infinite content, but current selections can be pretty hit-or-miss. Out of a sampling of 27 recent popular movies, Netflix offered just five. Apple and Vudu provided the most, with 21, while Sony and Vudu featured the most in HD, at 14 each.

With so many overlapping and evolving services, the impulse to wait out the market is understandable. But the wait may take a while. Online home theater options are proliferating, not consolidating. Yet while online entertainment provides instant gratification for some titles, shiny discs still offer higher quality and a wider selection. So for the foreseeable future, no one machine or service will answer all your entertainment needs. The upside is that, with the proper gear, there is more choice than ever. **PM**

Networked devices such as the TiVo HD DVR [1] and the Sony PlayStation 3 [2] can be updated to increase functionality. Both are now able to access online video.



Clauss® SpeedPak® Utility Knife Instructions

STEP-1

Insert 10 Blade
Titanium Cartridge

STEP-2

Back to work



SpeedPak®

Quick. Easy And Powerful

The most versatile knife on the market is also the easiest to use. The Clauss SpeedPak's 10-Blade cartridge system is a piece of cake. No digging for spare blades or a screwdriver. Just snap the cartridge into the knife and get a new blade in seconds. Allowing you to stay sharp. Utility, Hook, Dubbed and Serrated... 4 Blade cartridges, one solution...

SpeedPak.



ClaussCo.com
(800) 835-2263 X126

Available at





LAMINATE BACKSPLASH + COOL
ROOFS + SKYLIGHT LEAKS

DIY Home

Mastering Crown Molding

THE RIGHT TRIM TRANSFORMS A ROOM. HERE'S HOW SKILLFUL LAYOUT AND SMART SHORTCUTS CAN CHANGE AN APPRENTICE CARPENTER INTO A KING OF MOLDING.

BY JOSEPH TRUINI

→ **The first time** I installed crown molding, I probably wasn't really installing it at all—I was just handing my dad tools off the truck. Since then, I've put it in eight or 10 rooms, and around half a dozen bookcases and cabinets. Crown can go in any space, from the kitchen to the den, and of all the interior trim found in a home, none attracts more attention. A room with crown perched high at the wall and ceiling junction has an eye-catching focal point that a savvy realtor will point out along with granite counters and marble baths.

This job's 4½-inch crown came from a local lumberyard—still the best place for a wide-profile selection. I splurged on clear pine at \$2.70 a linear foot. If I intended to paint the crown, I could have gotten preprimed finger-jointed pine for \$1.60—and I'd be able to caulk over stray gaps before painting.

Installing crown is a bit trickier than other trim because it requires cutting compound angles. Plus, out-of-square corners and bulging, wavy walls can be a nightmare for a novice. But over the course of a dozen jobs, I've come up with a few shortcuts—I don't really remember where I learned a lot of these tricks, I just know them.

Site Prep

→ **Crown molding** is usually nailed to the wall studs along the bottom edge and into the ceiling joists above—a lot of stud-finder work. I skip all that by installing a plywood backer board to the top plate (the horizontal framing member above the wall studs). That method allowed me to nail this project's 4½-inch crown to any point along every wall.

To determine the width of the backer board, I held a piece of crown molding against the inside corner of a framing square and drew a line along the crown's back (1). The diagonal line, minus ⅛-inch for clearance, is the width of the backer board. I used a table saw with the blade set to 45 degrees to rip the backer boards from ¾-inch plywood, then fastened each board to the top plate with 3-inch drywall screws spaced 16 to 24 inches apart.

Saw Shortcut

→ **The power miter saw** and stand provide a safe, quick and accurate way to execute precise cuts. Choose a 10- or 12-inch saw with a dust-collection bag or exhaust port for attaching a wet/dry vacuum. Select a stand with an integral power strip and extendable arms to support lengths of molding. The Craftsman rig that I used included a 12-inch dual-bevel compound miter saw (\$350) and a pro-duty saw stand (\$250).

There are two ways to cut crown: Either lay it flat beneath the blade, or set it against the saw at the angle, the way it will be installed between the wall and ceiling. I prefer the latter. The flat method requires adjusting the saw blade to make both a bevel and miter cut; my way, the saw table acts as the ceiling, the fence is the wall, and an upside-down piece of crown can be cut at a compound angle with a simple 45-degree vertical chop.

To hold the crown in place, it helps to



The Setup

1. Trace the crown's rear to plan a backer board—installed between wall and ceiling, this board acts as a mount for the crown.
2. Clamp a board to the miter saw to create a simple, consistent way to hold crown in place as each piece is cut.
3. The cleat, with its middle cut away, holds inverted crown in the saw at an angle. Placing the molding in the saw this way allows simple vertical chops to create the compound angles necessary for the installation.

Straight Runs

4. Connect straight runs with scarf joints, which mate side-by-side pieces in a discreet seam. Fasten it by firing 2-inch finish nails or hand-nail 2-inch 6d nails.

clamp a cleat to the saw table. To set this up, I first clamped a length of molding with its edges flush against the saw's vertical fence and horizontal table. I pressed a 30-inch, straight-edged board tight against the crown and clamped it to the table (2). This piece, the cleat, stayed in place between cuts, so I could easily drop each piece of crown into position. I cut away the center of the cleat by making a left-hand and a right-hand 45-degree miter cut, opening a channel for the blade to pass through (3).

Straight Runs

→ **Most crown** comes in 16-foot lengths, so unless you're trimming out a gymnasium, a single piece can usually span each wall. When it can't, two lengths join end to end in a scarf joint (4). This combines opposing compound-angle miters in a clean, nearly undetectable seam. Molding can shrink or shift out of position slightly—with a scarf joint, as opposed to a square-edged butt joint, a gap won't appear at the seam. To form a scarf joint, I made a

Won't Start? Get Smart! Use...



Start!
Your Engines!
Fuel System Revitalizer



- Starts stubborn engines
- Revitalizes fuel system and freshens stale fuel
- Easy to use, just pour in the fuel tank
- Safe for use in 2 and 4 cycle engines
- Smooths rough idle and cures stalling

Available at Participating Dealers

O'Reilly AUTO PARTS

TSC TRACTOR SUPPLY CO.

ACE

True Value

NAPA



compound-angle miter cut on the end of one length of crown. I nailed the crown to the backer board and then made an opposing compound-angle miter cut onto the end of the mating length of crown. After applying a little wood glue to the joint, I slid the second piece of crown into position and nailed it to the backer board.

Inside Corners

→ **A coped joint** connects two pieces of crown molding at an inside room corner. I prefer this type of joint over a miter joint because wall corners are rarely perfectly 90 degrees. A coped joint, in which a piece of crown is tailored to fit an adjacent profile's curves, makes a tight-fitting seam even if the inside corner is out of square—as many are.

I cut the first length of crown with a square end, pushed it tight into the corner and nailed it in place. Then, I cut a compound-angle miter into the end of the mating length of crown (1). Next, I used a coping saw to back-cut the molding along its contoured profile (2). The idea is to saw away enough wood to allow the coped cut to fit tight against the profile of the first piece of crown. After cutting, the coped piece needed a little fine-tuning before it fit snugly. I smoothed the coped joint with rat-tail, half-round and flat files, as well as a wood dowel wrapped in 80-grit sandpaper (3).

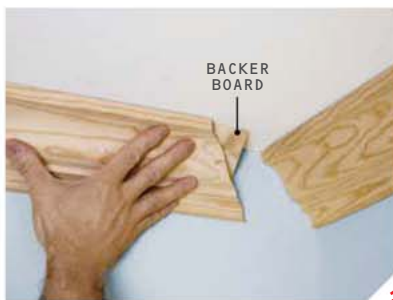


Outside Corners

→ **Outside wall corners** are seldom perfectly square, so simply cutting both crown pieces to 45 degrees usually won't cause them to meet snugly at the corner. A technique that I've used for years measures perfect outside miter joints, regardless of the wall angle. I hold two overlapping 20-inch-long 1 x 4s against the ceiling at the corner. I trace both edges of the bottom board onto the top board (4), then draw a diagonal line to connect the two

marks. Then I stack the 1 x 4s on the miter-saw table, adjust the saw blade angle to match the diagonal line and cut the 1 x 4s (5). I test-fit the 1 x 4s by holding them against the outside corner and checking the seam. If their edges don't make tight, even contact, I adjust the saw for a second cut. When the 1 x 4s fit on the wall, I lock the saw-blade angle and make a cut into one of the lengths of crown. Then I adjust the saw to make

an opposing miter cut—at the same angle—into the end of the mating piece of crown. With the first piece of the crown's end sitting flush with the wall corner, I drill a pilot hole and hand-nail it to the backer board with 1½-inch 4d finish nails (fired nails can deflect and break through the face of the molding). I add wood glue to the joint, slide the mating piece of crown into place (6) and nail it to the backer board.



Inside Corners

1. Cut a square-ended section on the miter saw and slide it into the corner. Cut the second piece at a 45-degree angle.
2. Use a coping saw to cut away the back of the second piece of molding, so that it can conform to the profile of the square-ended piece.
3. Fine-tune the coped molding by sanding it with a dowel rod wrapped in 80-grit paper.

Outside Corners

4. To make accurate cuts on out-of-square walls, start by tracing the edges of two 1 x 4s. Connect the lines.
5. Cut through both pieces along the connecting line. Once you get the boards to fit flush against each other on the corner, the saw is set to the correct angle.
6. Two mirrored miter cuts will yield a perfect outside corner—the pieces will meet neatly.

When was the last time you filled up?

Gas goes bad in as little as 30 days.



Same great product,
now with more
corrosion protection!

Use new, improved STA-BIL Fuel Stabilizer **AT EVERY FILL UP** to:

- Protect against corrosion caused by today's Ethanol fuels
- Prevent formation of gum and varnish build up
- Improve performance and reduce starting problems

When you store, start with STA-BIL®

©2009 Gold Eagle Co. www.sta-bil.com



**URNS ANY WET-DRY VAC
INTO A SUPERHERO.**

CleanStream® Pro Filters transform mild-mannered work vacs into super-powerful dust-fighters. With true HEPA filtration of 99.97% of even the finest particles, you'll get super cleanups without dust clouds. Sawdust, drywall dust, water - none of them stand a chance against the dynamic duo - your wet-dry vac and a Cleanstream Filter.



Dust has met its match.

Available at



Sears

McKenzie

Lowe's

cleanstream.com

Cleanstream and GORE are registered trademarks of W.L. Gore & Associates, Inc. © 2009 W.L. Gore & Associates, Inc.

CleanStream
Wet/Dry Vac Filter

Homeowners Clinic

by Roy Berendsohn

Q + A

TWO TOOLS

Simple hand tools quickly cut laminate to rough size.

Shears

- **Advantage:** Cuts straight lines and makes inside corner cuts. Little risk of breakage or cracking.
- **Disadvantage:** Slow.
- **Cost:** \$30



Knife

- **Advantage:** Makes long straight cuts quickly.
- **Disadvantage:** Doesn't work well on inside corner cuts. Laminate can crack if replaceable blade is dull and laminate is not thoroughly scored before snapping.
- **Cost:** \$10



The boomerang pattern is Formica's homage to 1950s industrial design and a reissue of a pattern it once produced.

Fabricating a Backsplash

Q Rather than cover the wall behind the counter with tile, I'd like to use plastic laminate as the backsplash in our kitchen. Can I glue it to the drywall? If not, how do I attach it? Everything I read about plastic laminate has to do with making countertops.

A Plastic laminate makes a great backsplash, but manufacturers recommend that you don't glue it to drywall. Instead, use a substrate such as particleboard or plywood that has at least one A-grade veneer face. There's a good reason for this: Adhesives work best on a clean, dry surface with a uniform texture. You're a lot more likely to

meet these requirements with a sheet of new material than with the existing drywall, which is probably painted and, worse, coated with layers of dust and cooking grease. No matter how much you scrub, you can never remove those contaminants thoroughly enough to ensure a proper bonding surface.

I'd recommend that you start by making a paper pattern of the backsplash area and use the pattern to size the plywood panel. Cut the panel and test its fit. Now, cut a slightly larger piece of plastic laminate using laminate shears, or score and snap it to size with a laminate cutter. Spread laminate

HARBOR FREIGHT TOOLS

Quality Tools at the LOWEST Prices

FACTORY DIRECT TO YOU!

How does Harbor Freight Tools sell high quality tools at such ridiculously low prices? We buy direct from the factories who also supply the major brands and sell direct to you. It's just that simple! Come see for yourself at one of our 330 STORES NATIONWIDE and use this 20% OFF Coupon on any of our 7,000 products. We stock Automotive products, Shop Equipment, Hand Tools, Tarps, Compressors, Air & Power Tools, Material Handling, Woodworking Tools, Welders, Tool Boxes, Outdoor Equipment, Generators, and much more.

NOBODY BEATS OUR QUALITY, SERVICE AND PRICE!

WHY WE HAVE 10 MILLION SATISFIED CUSTOMERS:

- ✓ We Buy Factory Direct and Pass the SAVINGS on to YOU!
- ✓ Shop & Compare Our Quality Brands Against Other National Brands
- ✓ 7000 Tool Items In-Stock!
- ✓ NO HASSLE RETURN POLICY
- ✓ Family Owned & Operated

LIFETIME WARRANTY
ON ALL HAND TOOLS!

SUPER COUPON! **20% OFF** **ANY SINGLE ITEM!**

Bring this coupon and Save 20% on one single item purchased at Harbor Freight Tools. Cannot be used with any other discount or coupon. One coupon per purchase. One coupon per customer. Coupon not valid on prior purchases or purchase of gift cards or purchase of extended service plans. Offer good on in-stock merchandise only. Savings discount percentage off Harbor Freight Tools current prices, including sale prices. This coupon cannot be duplicated in any manner including photocopies and computer printouts. Original coupon must be presented in order to receive the discount. All Campbell Hausfeld products are excluded from this offer. This offer is not valid on food or beverage items sold in our retail stores. Valid only in Retail Stores through 2/13/10.



42967109

See HarborFreightusa.com/Popmechanic for additional SUPER COUPONS

SUPER COUPON! **SAVE \$50**

LARGE STEEL SERVICE CART WITH LOCKING DRAWER
LOT NO. 90428

350 LBS. CAPACITY

\$49.99

REG. PRICE \$99.99

33755240

HARBOR FREIGHT TOOLS - LIMIT 1
These valuable coupons are only good when presented at your nearest Harbor Freight Tools store. Offer Ends 2/13/10. Coupons valid in Retail Store Only. Coupon not valid on prior purchases. Coupon cannot be bought, sold, or transferred. This coupon cannot be duplicated in any manner including photocopies and computer printouts. Original coupon must be presented in order to receive the discount.

SUPER COUPON! **SAVE 46%**

Pittsburgh 6 PIECE PLIERS SET
LOT NO. 38082/46005
Item 38082 shown

\$7.99

REG. PRICE \$14.99

64486079

HARBOR FREIGHT TOOLS - LIMIT 1
These valuable coupons are only good when presented at your nearest Harbor Freight Tools store. Offer Ends 2/13/10. Coupons valid in Retail Store Only. Coupon not valid on prior purchases. Coupon cannot be bought, sold, or transferred. This coupon cannot be duplicated in any manner including photocopies and computer printouts. Original coupon must be presented in order to receive the discount.

SUPER COUPON! **SAVE 50%**

MULTIFUNCTION POWER TOOL
LOT NO. 67256
CHICAGO Electric Power Tools

\$29.99

REG. PRICE \$59.99

14120851

HARBOR FREIGHT TOOLS - LIMIT 1
These valuable coupons are only good when presented at your nearest Harbor Freight Tools store. Offer Ends 2/13/10. Coupons valid in Retail Store Only. Coupon not valid on prior purchases. Coupon cannot be bought, sold, or transferred. This coupon cannot be duplicated in any manner including photocopies and computer printouts. Original coupon must be presented in order to receive the discount.

SUPER COUPON! **SAVE 50%**

4-1/2" ANGLE GRINDER
LOT NO. 95578

\$9.99

REG. PRICE \$19.99

18532119

HARBOR FREIGHT TOOLS - LIMIT 1
These valuable coupons are only good when presented at your nearest Harbor Freight Tools store. Offer Ends 2/13/10. Coupons valid in Retail Store Only. Coupon not valid on prior purchases. Coupon cannot be bought, sold, or transferred. This coupon cannot be duplicated in any manner including photocopies and computer printouts. Original coupon must be presented in order to receive the discount.

SUPER COUPON! **SAVE 41%**

5000 LB. CAPACITY ADJUSTABLE TOW BAR
LOT NO. 94696

\$34.99

REG. PRICE \$59.99

11927043

HARBOR FREIGHT TOOLS - LIMIT 1
These valuable coupons are only good when presented at your nearest Harbor Freight Tools store. Offer Ends 2/13/10. Coupons valid in Retail Store Only. Coupon not valid on prior purchases. Coupon cannot be bought, sold, or transferred. This coupon cannot be duplicated in any manner including photocopies and computer printouts. Original coupon must be presented in order to receive the discount.

SUPER COUPON! **SAVE 43%**

300 LB. CAPACITY LOW-PROFILE CREEPER
LOT NO. 2745

\$16.99

REG. PRICE \$29.99

96466347

HARBOR FREIGHT TOOLS - LIMIT 1
These valuable coupons are only good when presented at your nearest Harbor Freight Tools store. Offer Ends 2/13/10. Coupons valid in Retail Store Only. Coupon not valid on prior purchases. Coupon cannot be bought, sold, or transferred. This coupon cannot be duplicated in any manner including photocopies and computer printouts. Original coupon must be presented in order to receive the discount.

SUPER COUPON! **SAVE 66%**

CENTRAL PNEUMATIC HIGH SPEED METAL SAW
LOT NO. 113/91753
Item 113 shown

\$9.99

REG. PRICE \$29.99

14758981

HARBOR FREIGHT TOOLS - LIMIT 1
These valuable coupons are only good when presented at your nearest Harbor Freight Tools store. Offer Ends 2/13/10. Coupons valid in Retail Store Only. Coupon not valid on prior purchases. Coupon cannot be bought, sold, or transferred. This coupon cannot be duplicated in any manner including photocopies and computer printouts. Original coupon must be presented in order to receive the discount.

SUPER COUPON! **SAVE 71%**

12" RATCHET BAR CLAMP/SPREADER
LOT NO. 46807

\$1.99

REG. PRICE \$6.99

10591477

HARBOR FREIGHT TOOLS - LIMIT 4
These valuable coupons are only good when presented at your nearest Harbor Freight Tools store. Offer Ends 2/13/10. Coupons valid in Retail Store Only. Coupon not valid on prior purchases. Coupon cannot be bought, sold, or transferred. This coupon cannot be duplicated in any manner including photocopies and computer printouts. Original coupon must be presented in order to receive the discount.

We Will Beat Any Competitor's Price Within 1 Year Of Purchase!

330 STORES NATIONWIDE

TO FIND THE STORE NEAREST YOU CHECK:

1-800-657-8001

or HarborFreightusa.com/Popmechanic

adhesive (not woodworker's glue or any other adhesive) on the back of the laminate and on the panel's face (the A veneer side, if it's plywood). Let the adhesive on both pieces dry. Next, place a row of ¼-inch-diameter dowel rods on the adhesive side of the panel and place the laminate in position on the rods. Slide the dowels out, and bring the two adhesive surfaces into contact. Press the laminate down firmly or work over it with a roller. Finally, use a router and flush trim bit to cut away excess laminate.

A few things to keep in mind. First, it takes some planning to conceal the panel's mounting screws and to ensure that the panel face is flush to the dry-wall. It's easiest to mount the back-splash before the cabinets are installed. That way you can hide the mounting screws behind the cabinets. Also, you have any number of patterns and thicknesses to choose from. There is a vertical grade of laminate, designed for backsplash applications, that is slightly thinner than laminate designed for horizontal counter applications. The vertical type is easier to cut.

Finally, if the backsplash is mounted over switches and outlets that are already installed in a drywall surface, you'll need a piece of hardware called a box extender. The extender is a sleeve that mounts over the electrical box, and it covers the gap created by the thickness of the backsplash panel. It's far easier to install an extender than to try and move the electrical box forward so that its edge is flush with the surface of the backsplash.

Carpets as Insulation

We're tearing out a houseful of carpet. Can we recycle any of it as attic insulation?

I wouldn't. Yes, it's likely that carpet would provide some insulation benefits, but it's also likely it will disintegrate from the intense attic heat. Besides that, if you go to sell the property someday, a home inspector will surely flag the "insulation," and the prospective owner will demand its removal.

Still, you're raising a question that

KNOW YOUR STUFF

Fillers

SPACKLING PASTE	COLORS WOOD PUTTY	EPOXY STICK	EPOXY-BASED WOOD FILLER
BEST FOR			
Filling small cracks and minor dents in wood, masonry and metal.	Concealing nail holes and minor surface blemishes.	Odd jobs, repairing metal, or resetting hardware on knockdown furniture.	Rebuilding painted wood architectural elements, such as windowsills.
DETAILS			
Formulated for specific jobs, such as interior or exterior work, or shallow dents, such as those in metal doors.	A soft putty that retains its flexibility. Buy several shades and blend to make a perfect color match.	Inner and outer portions of stick must be mixed thoroughly and used quickly before the mixed portion hardens.	Carve off excess before it hardens to reduce the need for excessive sanding or grinding.

lots of people are asking: Why isn't carpet more easily recycled? The carpet industry estimates that roughly 5 billion pounds of carpet end up in landfills each year. A nonprofit group called CARE (Carpet America Recovery Effort) has been formed to divert some of the waste stream and convert it into useful materials, such as decking, flooring, composite lumber and reinforcing fibers for concrete. There are carpet reclamation centers sprinkled around the country, but most are designed to take carpet from commercial sources, not homeowners. Furthermore, many of these companies charge from 5 cents to 25 cents a pound to take the material, which typically weighs 4 to 5 pounds per square yard.

If you manage to find a reclamation or flooring company that will work with you, don't just show up with a pickup-truck load. Some older carpets with jute backing are difficult to reclaim. "Your best bet is to bring in a small carpet sample and some padding first," advises Jeremy Krasny, owner of Western New York Professional Flooring in Cheektow-

aga, N.Y. And after all that effort, you may get a lucky break. "Usually we take it at no charge," Krasny says.

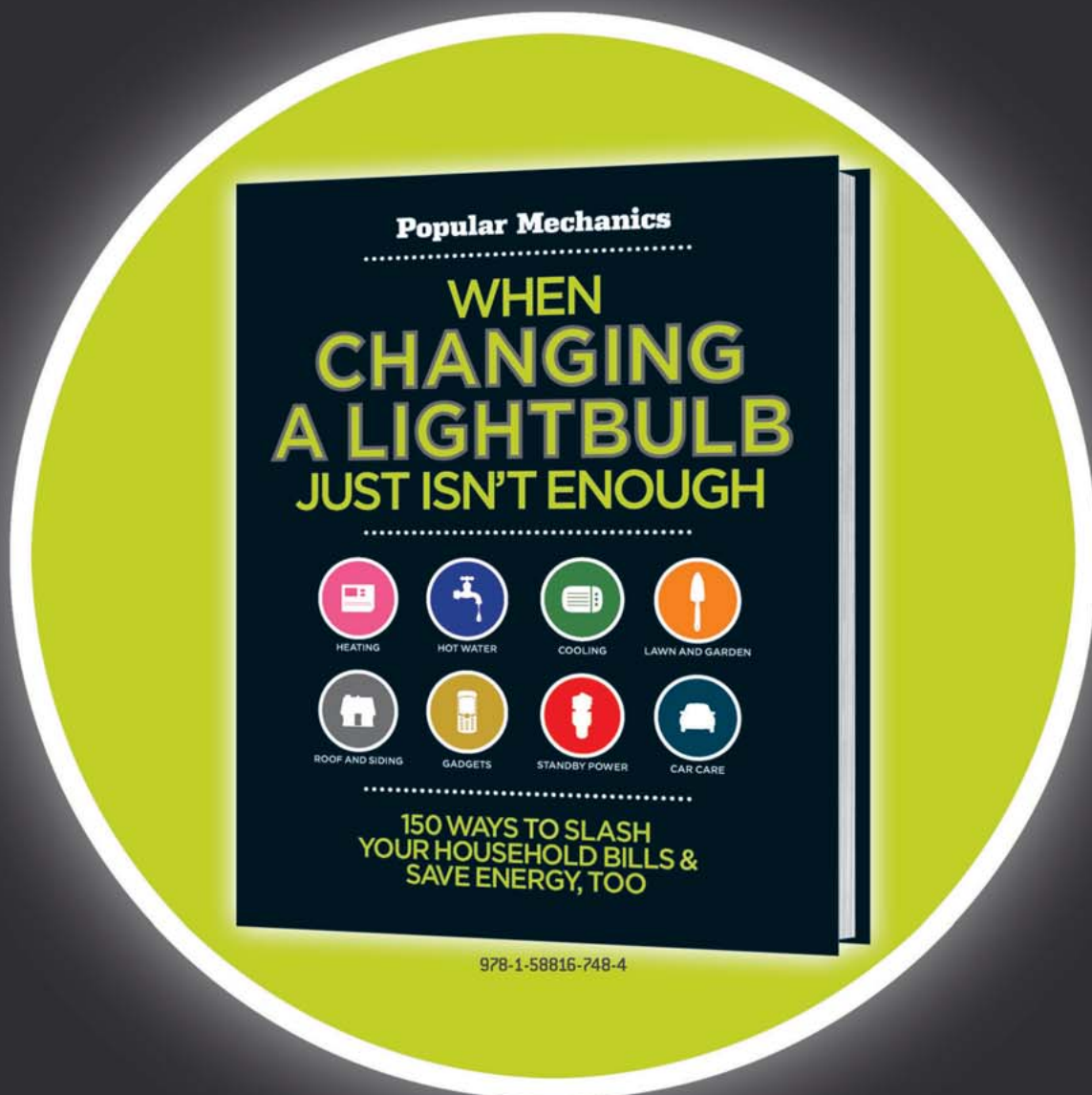
Leaking Skylights

My skylight leaks. I replaced the window well and sealed the flashing and it still leaks occasionally at one corner. What could be the problem?

If it were my house, I'd remove the skylight and replace it with a new one. Repeated leaks are a sign of faulty installation or damage.

A skylight can be installed in one of two ways: above the roof deck on a small curb or set into the deck. The former method is best used on shallow roofs or when the skylight is positioned near a wall that meets the roof. By elevating the skylight, the curb makes it less vulnerable to leakage caused by water that accumulates on the roof or that runs off a sidewall. Flush-mounted skylights are typically installed on steeper roofs.

Before purchasing a skylight, you might want to visit the manufacturer's website and make sure it offers detailed installation instructions.



978-1-58816-748-4

Slash Your Household Bills & Save Energy, Too

Sure, you know that it makes sense to be earth-friendly. But did you realize that eco-smart is also *financially* smart? Small changes can make a big impact on the world *and* your wallet and our new book shows you how.

Save money...and reduce your carbon footprint:

- Get the best gas mileage out of your car
- Select sustainable and cost-effective renovation materials
- Maintain a lush, healthy lawn while saving hundreds of gallons of water
- Lower your energy bills by performing utility audits
- And so much more

**With this book you'll be making a sound investment in greener living.
Because if it won't save you money, it's not in here!**

\$14.95 (Can. \$19.50) in hardcover

Available wherever books are sold, or call 1-866-338-3778 to order, or go to www.bn.com/pmlightbulb.

Have a question about our books? We'd love to hear from you. Email us at booklover@hearst.com.

HEARST BOOKS
A Division of Sterling Publishing Co., Inc.

You Drive. It Learns. You're Protected.



Proud Sponsor of the
BMW Rahal Letterman
Racing Team

NEW



Radar, Laser and Safety Camera Detector



Speed Camera

Speed Trap

Red Light Camera

Introducing the all-new **PASSPORT 9500ix** — the next great leap forward in total road protection. Its exclusive AutoLearn feature acts like artificial intelligence, sorting out the real threats from those that just don't matter. In addition, the 9500ix provides GPS based alerts for high-risk intersections and fixed position speed cameras which are becoming more popular all over North America. It's even web-ready, allowing you to connect it to your PC for updates.

For more information about the PASSPORT 9500ix, or to take a free 30-day test drive, simply call or visit our website today.



www.EscortRadar.com

PASSPORT 9500ix \$499.95 +\$6H (OH res. add tax)

ESCORT
THE RADAR AND LASER EXPERTS

©2009 ESCORT Inc.

Call 1-800-852-6258

► Department PМЕCH

PM DIY HOME ///
HOMEOWNERS
CLINIC Q+A

Foundation Gyration

We have clay soil where we live in Alabama, and when it dries out, big cracks form in the soil and sometimes foundations move. Severe cracks developed in our neighbor's foundation, and we want to be sure the same thing doesn't happen to us.

What should we do?

It sounds like your house is located in a region with a high concentration of something known as expansive clay, a type of soil that can heave sidewalks and crack foundations. It causes millions of dollars in property damage every year, yet the phenomenon is little known to laymen outside the areas where it occurs (mostly in the southern and western U.S.).

The culprit is a clay with a molecular structure that attracts water molecules, causing the clay to expand dramatically—sometimes to two or three times its normal volume. Then, as the soil dries out, it contracts just as severely.

The best thing you can do is to keep the soil's moisture at an even, optimal level, and you'll need some expert advice to find out what that level is. It can vary depending on the site, soil conditions in the region and the amount of rainfall your area experiences. For example, a tree can shade a site and prevent rapid drying of the soil (a good thing) or its roots can be long enough to press against a foundation and pull moisture from the soil or clog a footing drain (a bad thing). Only someone who is an expert on local conditions will know whether you should keep the tree or fell it. They may advise digging a test pit to see if the tree's roots are encroaching on the foundation wall. Before you do anything, consult a civil

Families Have Saved Up To 50% On Heating Costs

And never have to buy fuel — oil, gas, kerosene, wood — ever again!

Your Benefits with Hydro-Sil:

- Slash heating cost with Hydro-Sil
- Furnace free — duct free
- Lifetime warranty. No service contracts
- Safe, complete peace of mind
- Clean, no fumes, environmentally safe
- U.L. listed
- Preassembled — ready to use
- Portable (110V) or permanent (220V)
- Whole house heating or single room

Contact us
today for
info and
FREE catalog!

Lifetime Warranty

Hydro-Sil is a high performance individual room heating system that can save you hundreds of dollars in home heating costs by replacing old and inefficient heating. It can replace or supplement your electric heat, gas or oil furnace and woodstoves.

Hydro-Sil represents economy in heating: inside the heater is a sealed copper chamber filled with a harmless silicone fluid designed for heat retention qualities. The fluid is quickly heated by a varying amount of micro-managed proportional power. This exclusive technology greatly increases energy savings.

Check ■ MasterCard ■ Visa ■ Discover

1-800-627-9276

www.hydrosil.com

Hydro-Sil, P.O. Box 662, Fort Mill, SC 29715

220 VOLT PERMANENT	Approx. Area to Heat	S&H	Discount Price	Qty.
8' 2000 w	250-300 sf	\$25	\$319	
6' 1500 w	180-250 sf	\$25	\$289	
5' 1250 w	130-180 sf	\$25	\$259	
4' 1000 w	100-130 sf	\$18	\$239	
3' 750 w	75-100 sf	\$18	\$189	
2' 500 w	50-75 sf	\$18	\$169	

Thermostats — Call for options & exact heater needed.

110 VOLT PORTABLES (Thermostat included.)	S&H	Discount Price	Qty.
5' Hydro-Max 750-1500 w	\$25	\$229	
3' 750 w — Silicone	\$18	\$179	
Heavy-Duty 240v	\$25	\$329	

Total Amount

Name _____
Address _____
City _____ St _____
Zip _____ Phone _____
MasterCard, Visa or Discover Account Information:
Acct # _____
Expiration Date _____

■ IN THE NEWS

Are White Roofs Worth the Cost?

→ **People don't usually turn** to late-night comedy shows for home-improvement advice, but *The Daily Show with Jon Stewart* recently weighed in on roofing materials when U.S. Secretary of Energy Steven Chu extolled the virtues of reflective or



In ideal conditions, light-colored roof shingles can reflect summer heat to save up to 20 percent on air-conditioning costs.

"cool" roofs.

"When you're thinking of putting on a new roof, make it white," Chu said. He cited research by Hashem Akbari at the Lawrence Berkeley National Laboratory, which found that white or light-colored rooftops reflected enough sunlight from a building to trim air-conditioning bills by as much as 20 percent. So should all Americans start planning to replace their roofs? Not necessarily.

The savings generated by a cool roof won't equal the costs of re-roofing, Akbari says, so the step should really only be

considered for new roofs, or for aging roofs already due to be replaced. Flat-roofed commercial structures gain the greatest benefit from going white because they directly reflect sunlight, Akbari says—pitched house roofs don't reflect light as effectively, and buildings with vented, insulated attics already prevent rooftop heat from transferring to the conditioned spaces below.

But the science is sound, even in places with light a/c loads. Tim Leonard of ERSysystems, a roofing manufacturer in Minnesota, compared summer savings for white roofs against the energy saved when a dark roof absorbs solar heat in winter. White roofs won, with four to five times as much money saved, even so far north. "It's not until you get up into Canada that the cost benefit starts to even out," Leonard says.

California has mandated cool roofs since 2005, and more recently, Chicago enacted new standards requiring reflective roofs. Those rules have helped create a list of compliant products, available at cityofchicago.org. Cutting one-fifth of a/c costs usually won't save a whole lot of money. But for homeowners ready to re-roof, the savings should cover the price to switch. On Chicago's list, light shingles cost little or no more than dark ones.

—ANDREW MOSEMAN

engineer with soils-engineering experience. In some regions, foundation-repair companies handle this work.

Common sense can also go a long way in preventing problems. For example, if you notice the soil has dried out near the foundation and a gap has opened around it, don't hose down the area, flooding it in an attempt to

moisten the soil and close the gap. This can cause water to run down the foundation wall and erode soil away from it, enlarging the gap in the process and perhaps even undermining the building's footings. Instead, if a long dry spell is forecast, run sprinklers on the lawn (about 4 feet from the foundation) to keep the soil moist. **PM**

STOP DREAMING, START DRYLOKING



Is a wet basement holding back your home's potential? For over 55 years, DRYLOK® has satisfied millions of homeowners giving them a proven solution to help get the space they need! DRYLOK products are Independently Tested* and are guaranteed to stop water - even under pressure.

For more product information or a FREE step-by-step project guide visit www.ugl.com or call 1-800-272-3235 or visit your local DRYLOK Dealer, there is one just around the corner.

*DL Labs, 2008



The more you know, the better you sleep.™



Introducing Zeo, the world's first personal sleep trainer!

Tired of feeling tired?

Getting a handle on your sleepless nights can be tricky — they don't appear to follow any rhyme or reason. Often, there are hidden "sleep stealers" that can rob you of the *restorative* sleep you need to feel your best.

Is better sleep a mystery?

How can you know how well you *really* sleep? Or, measure the hidden impact of sleep disrupters? Or know how to address problems you can't "see?"

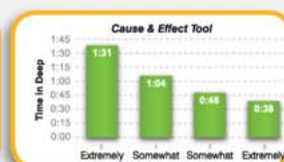
Zeo has the answers

Introducing Zeo — the world's first personal sleep coach. A revolutionary new technology developed with leading scientists, Zeo identifies *your* unique cause and effect patterns and then provides personalized, expert advice to help you sleep better and feel your best.



Zeo's Softwave™ sensor technology shows you how you really sleep every night — the quality of your sleep, how much restorative Deep and REM sleep that you're getting.

And, Zeo is the only way to get this information in the comfort and privacy of your own bedroom.



Zeo then powerfully portrays how your lifestyle choices and environmental factors affect your sleep.



Finally, Zeo teaches, guides and motivates you with highly personalized e-mail messages and our online sleep coaching program to help you get a better night's sleep.



"absolutely critical to being a daytime peak performer."

Sleep expert and Fortune 500 sleep consultant Dr. James Maas

"I have had my Zeo for a month and I absolutely love it. I am so much more aware of my ACTUAL sleep patterns now which have helped me determine how to improve them. Knowledge rules!! Thanks Zeo."

Barbara W, Zeo Customer



Take the guesswork out of your sleep problems

Order now to get the headband, bedside display, full access to our user site and your personalized sleep training program.

**TRY IT RISK-FREE FOR 30 DAYS
PLUS GET FREE SHIPPING**

1-888-714-9517
www.ZeoPMC.com

© 2009 Zeo Inc., All Rights Reserved. Zeo Personal Sleep Coach is neither a medical device nor a medical program and is not intended for the diagnosis or treatment of sleep disorders. If you suspect that you may have a sleep disorder, consult your physician



FULL TIRES + FUN WITH MAGNETS +
GLOBAL WARMING + NOISY DIODES

DIY Auto

degree of difficulty | EASY

Saturday
Mechanic



Tire-Pressure Monitoring Systems

HOW TO KEEP YOUR TPMS FUNCTIONING PROPERLY. BY MIKE ALLEN



→ **It's hot. Real hot.** Fortunately, the new car you bought right before that Arizona spring-break road trip has air conditioning that works great, in spite of the heavy pop-up trailer and loaded roof rack weighing it down. You pull in for gas and lunch, and carefully check

the pressure in the trailer tires with the gauge that lives in your glovebox. The tires on your crossover are fine though, because all new cars have a tire-pressure monitoring system that will tell you if your tires are low from the comfort and safety of your driver's

When this warning lamp illuminates on your instrument panel, at least one of your tires is 25 percent below its correct pressure. This TPMS sensor uses a lithium battery with a five- to 10-year life span. But you still need to keep a decent tire gauge in your glovebox.



TPMS
SENSOR

seat. The desert beckons, and 40 miles of heat-shimmered asphalt later, a tire blows. What happened?

After swapping in the spare, you continue your trip at a more sedate pace. The TPMS light is on, and you stay well under the speed limit until you can check the tire pressures with a gauge. Surprise—they're all low. Surprise No. 2: The TPMS light remains on after you top off the tires to the correct pressure, at least until you can get a replacement tire mounted later in your trip.

Be Prepared

→ A Department of

Transportation study dating back to 2001 says that 60 to 80 percent of cars on the road are running tires underinflated by as much as 10 percent. Worse yet, they say that 20 to 50 percent are being driven with tires down in pressure by as much as 20 percent. Yet, here's the scariest part: If your tires are low, even falling into that minus 20 percent category, your TPMS won't tell you—ever. The TPMS warning light is only required to illuminate when the pressure gets 25 percent below the correct value, which is enough to reduce fuel economy, lower the available grip (especially in wet conditions) and make tires run substantially hotter.

Bottom line: Don't trust the TPMS. Once you understand how your TPMS system works, you'll understand why it doesn't obviate the need for regular tire-pressure monitoring.

The Easy Way

→ **There are two types** of TPMS on the market, direct-reading and indirect. Indirect systems use only software and readouts from the individual wheel-



1

TPMS senders are usually attached to the valve stem, although some are banded to the wheel's drop center. These units can cost over \$100, but replacements for most domestics can be found on the aftermarket for \$50 or less. They're prone to damage from tire-mounting machines, so get your tires mounted by a knowledgeable technician.

2

In an attempt to reduce the sensor's mass and keep the wheel in balance, the metal stem of the sender is commonly made of aluminum. *Soft* aluminum. Use a torque wrench on the inch-pound scale to tighten these, because it's really easy to strip the threads by overtightening. Ferrous-metal valve caps may interfere with the electronics, so stick with OEM-style plastic valve-stem caps.

speed sensors used by the antilock brake system. If all four tires are properly inflated, they will all rotate the same number of revolutions in a stretch of road. If one tire rotates more than the other three, it has a shorter rolling radius because the pressure in it is low.

The indirect type of system is inexpensive, because the only real part that must be added to a car is the display on the dash and some extra code in the vehicle's operating system. Properly inferring tire pressures this way can be a problem when the tires are unevenly worn, or if you replace only two worn tires instead of all four. You can reset the system to allow for wear when all the tire pressures are correct. The procedure varies from vehicle to vehicle, and this one won't necessarily work on yours. Persistent TPMS warnings can often be cured by setting the tire pressures properly and then resetting the TPMS somewhere in the menu on the driver's display, or perhaps with a scan tool. If the system isn't reset this way, TPMS warning lights will also crop up after a normal tire rotation, or if you're replacing tires with ones of a different size from the old ones.

The Better Way

→ **There is a much better** (read: more expensive) technology to monitor tire pressures. Higher-end vehicles use a direct-reading system of battery-powered senders mounted inside the tire, communicating with the TPMS by means of small antennas in each wheel well. Every few minutes, the TPMS will interrogate the senders in the wheels, acquire a "true" pressure reading and transfer the message to the in-car display.



NEW: FEIN WS 14

► powerful

► reliable

► safe

Performance. Precision. Practicality.
And now a little extra spark.
Introducing the world's
first switchless grinder.



NEW

By now, you've probably heard the buzz about FEIN compact angle grinders. After all, they're robust, reliable and built to last. And now there's even more reason to be fired up. Meet the new **FEIN WS 14 series angle grinders** — a new line of angle grinders including a switchless option. It can come equipped with a special safety package, including **TipStart** function with **AutoStop**. If you're more accustomed to traditional grinders, the **WS 14 series** can also come equipped with the sliding lock system. Plus, it's smaller, easier to handle and generates less vibration. Order today, and you'll receive our **special limited time offer**.

To order your FEIN WS 14 angle grinder and receive our special limited time offer, call 1-877-771-0088 or log on to **www.feinus.com**



But what's to keep the system from reporting the tire pressure of the car next to you at a traffic light? In order to keep things straight, the individual senders have a unique serial number to transmit to the vehicle. And that keeps individual wheels on each corner of the car properly sorted in the TPMS's tiny little brain. On many vehicles, there's even a sender on the spare tire. The TPMS is initialized with the position of the four (or five) tires when the car is new. Eventually, those tires could

change position, through normal tire rotation or as the result of a flat. That's why there is a procedure to resynchronize the system. For most vehicles, it involves the use of a special tool that communicates with the vehicle and the sender to make everybody play nice. This device knows which wheel is which because it's held next to each valve stem in turn as the system is programmed. Your car dealer will have one, and some independent repair shops might as well. Unfortunately,

they're different for every brand of car, and they cost plenty, with basic models going for \$600 to \$800, and those that work on a variety of vehicles running up to \$2500.

Fortunately, it's rarely necessary to use the factory-style tool. Each manufacturer has its own tool and procedure. Look in (surprise!) the owner's manual.

Here's a typical procedure for teaching the TPMS system which wheel is which:

1. Place the ignition switch in the "ACC" position.
2. Simultaneously press the keyless entry transmitter's lock and unlock buttons until a horn chirp sounds. This will put the system in "learn mode."
3. Starting with the left front tire, increase/decrease the tire pressure for 5 to 8 seconds, then wait for a horn chirp. The horn chirp may occur before the 5-to-8-second pressure increase/decrease time period has been reached, or up to 30 seconds after the 5-to-8-second pressure increase/decrease time period has been reached.
4. After a horn chirp has sounded, proceed as in step 3 for the next three sensors in the following order: right front, right rear, left rear.
5. After the LR sensor has been learned, a double horn chirp will sound, indicating that all sensors have been learned.

And all of this has to happen within 2 minutes, or the learn mode times out and you'll have to start over. Also, if anyone nearby is adjusting tire pressures on a car with TPMS sensors, the system may be confused. If your vehicle's TPMS includes the spare, burrow into the trunk and get access to the spare first. Don't forget to top off the tires to the correct pressure.

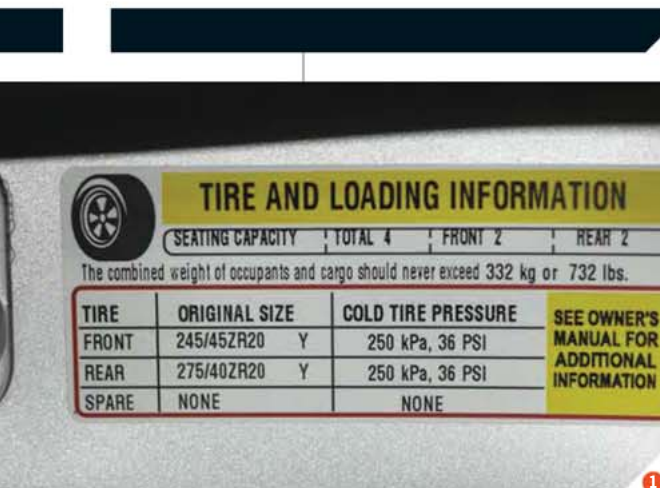
On some GM cars you can activate the wheel sensors with a simple, powerful horseshoe magnet. GM has a special tool for this, but I'll bet a nice strong magnet from RadioShack would work. On Toyotas, apparently the only way to activate the sensors is with the Toyota TPMS tool or scan tool. Your mileage may vary. You'll need to find out exactly what procedure your vehicle needs any time you rotate tires or install winter tires. Consult your owner's manual, or the factory service manual. Be wary of advice on TPMS from enthusiast websites: A lot of the procedures I saw there were wrong or just plain out-of-date.

Special Considerations

→ **If you ever need** to replace a valve-stem core, use stainless steel rather than brass to avoid corrosion. It's one thing to replace a \$2 rubber valve stem

and something else entirely to replace a \$100 TPMS sensor. And always use that cap. Water, road salt or mud could affect the sensor.

One last thing: That can of aerosol flat-fixer in your trunk may damage the sensor. Yes, it says "Sensor Safe" on the label, but experience in the field says it's a bad idea. The hole-filling compound may well plug up the hole in the sensor that checks pressure. If you must use one of these products, take the vehicle to a properly trained tire technician as soon as possible to have the hole plugged properly from the inside. **PM**



1

The definitive correct tire pressure is on this sticker on the door frame. This info is also in the owner's manual. Ignore what's printed on the tire sidewall. Your car manufacturer has determined what pressures will make your car handle properly. The pressure on the sidewall is the maximum pressure for any vehicle.



2

Tire pressure should be checked in the morning on cold tires, not after you've driven to Starbucks. Tire pressure changes 1 psi for every 10 degrees of

outside temperature. A change from 70 F to 40 F will lower the pressure 3 psi, enough to affect wet braking and fuel economy; check your pressures monthly.

Win Both Cars and Help Deserving Kids

Corvette Dream Giveaway

A Dream Giveaway™ sweepstakes

To benefit Kids Wish Network's Hero Program

To enter go to

winthevettes.com

Or call toll free

866-WIN-BOTH

(866-946-2684)



Restored 1967 427/390 HP Corvette Roadster, tuxedo black with red stinger, side exhaust, 4 speed, aluminum wheels. The perfect car to drive or show.



Serial
#1 of 1

2009 ZR1 "HERO EDITION" one-of-a-kind 638 horsepower capable of over 200 MPH. A priceless piece of automotive history.

Enter Now to Win Both of These Incredible Cars!!

Winner will be announced December 25, 2009. All entries must be received and processed by 11:59 PM EST, December 22nd, 2009.



Tony Stewart at the NASCAR track with "Wish Kid" fan, Patrick

TICKETS

1 Ticket	\$3
5 Tickets	\$10
15 Tickets	\$20
40 Tickets	\$50
100 Tickets	\$100
240 Tickets	\$200



2008 Dream Giveaway Winner David Rutherford in his Lingenfelter Corvette.

To learn more about this pair of rare musclecars, Kids Wish Network, Corvette Dream Giveaway or our sponsors, please visit www.winthevettes.com

Yes, I want to help these kids and win both cars!

COMPLETE CREDIT CARD INFO OR MAKE CHECKS PAYABLE TO:

Kids Wish Network
P.O. Box 17443
Indianapolis, IN 46217-7443

☐ VISA ☐ MasterCard ☐ DISCOVER ☐ AMERICAN EXPRESS

Name: _____ Phone: _____

Address: _____

City: _____ State: _____ Zip: _____

Card # _____ Exp: _____ Security Code: _____

☐ Email: _____

No charge for email - receive your tickets and updates fast and FREE!

☐ Mail Tickets Add \$1.95 mail/processing for tickets by mail

☐ I HEREBY CERTIFY THAT I AM 18 YEARS OF AGE OR OLDER
Credit Card Orders may be FAXED TO: 317-807-0526

Kids Wish Network
where dreams really do come true...
A 501(c)(3) Charitable organization
www.kidswishnetwork.org

Use Promo Code: PM1109

☐ 1 TICKET	\$3	☐ 240 TICKETS	\$200
☐ 5 TICKETS	\$10	☐ 360 TICKETS	\$300
☐ 15 TICKETS	\$20	☐ 600 TICKETS	\$500
☐ 40 TICKETS	\$50	☐ 900 TICKETS	\$750
☐ 100 TICKETS	\$100	☐ 1200 TICKETS	\$1000

Ticket Purchase \$ _____

Mail/Processing: Add \$1.95 (\$0 email)

**TOTAL AMOUNT
ENCLOSED:** _____

Please allow 2 to 3 weeks for mail delivery

DISCLAIMER: DONATION NOT REQUIRED TO PARTICIPATE AND WILL NOT INCREASE YOUR ODDS OF WINNING. Void where prohibited by law. Winner need not be present to win. Winner responsible for all applicable taxes. See official rules for details at www.winthevettes.com.

Car Clinic

by Mike Allen

Q + A

An Attractive Proposition

Q Where can I find one of those cool magnetic screwdrivers I saw my mechanic using? He was able to start a Phillips-head screw in the most impossible-to-reach location by simply sticking the screw head to the tip of the screwdriver blade and twisting away.

A I've owned a few "magnetic" screwdrivers in my career. Usually these have been gifts that one of my well-meaning friends or relatives has given me as a token of their esteem. Most of the time, they're a big pain. The magnet makes the tip stick to stuff besides the screw head, ruining your aim. They often have replaceable tips, held in place by the magnet, and the tip has a tendency to stay attached to the fastener rather than remaining in the screwdriver's shank. In fact, I found a magnetic Torx bit still attached to a bolt just last week. As far as I can remember, I left it in my toolbox over a year ago. There are a bunch of ways to aid and abet your aim when installing fasteners in tough-to-reach places. A little masking tape or duct tape on the end of the screwdriver is a good solution. I've also used weatherstrip adhesive. In fact, that's what NASCAR teams use to secure lug nuts onto rims before wheels are installed. So when it's time for a tire change, the mechanic can simply throw the wheel and tire onto the hub and rattle the lug nuts tight one-handed with an air wrench.

But the simplest way to get the magnetic effect without buying new tools is to temporarily magnetize the tip of your nearest screwdriver. Stroke the shank

How to magnetize a screwdriver:

Using any powerful magnet—like the parts retriever already in your toolbox—stroke the screwdriver its full length six to eight times.

Now small parts will cling to the end. A quick slam to a hard floor knocks the magnetic domains out of alignment and kills the attraction.

with a pickup magnet (or any other powerful magnet) in one direction a half-dozen times. It'll pick up enough magnetism to hold your screw. Best part—just drop the screwdriver to the shop floor once or twice, and knock the magnetism right out of it. (The shock scrambles the magnetic domains in lightly magnetized steel.) That way, your tools won't cling together like airline cutlery.

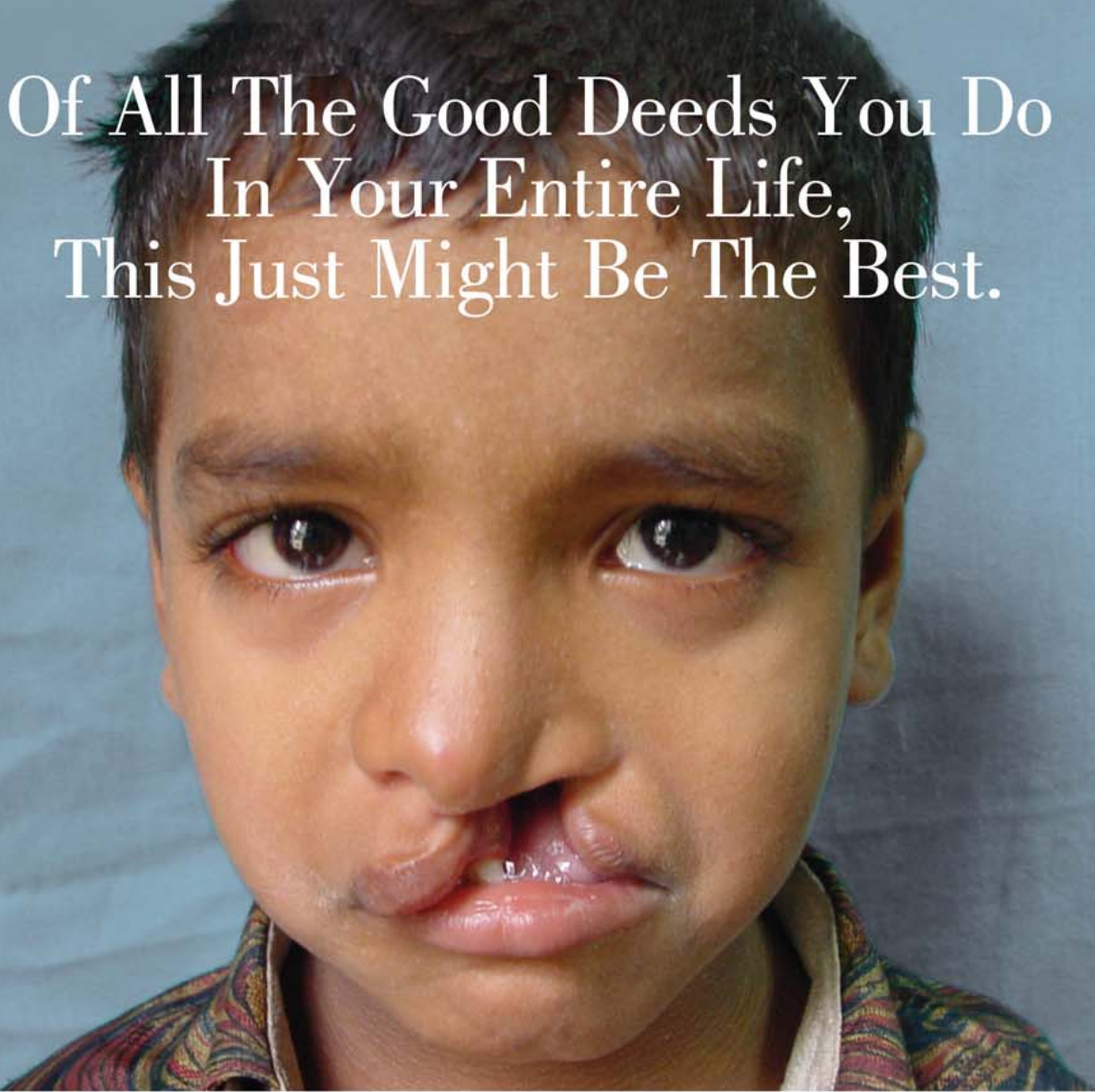
Make Lemonade

My son has been stationed in Baghdad for over six months. He

owns a 2007 Ford Escape V6 with 34,000 miles, which has been at a Ford dealership since last winter.

They say it has a failed catalytic converter, which (to the best of my understanding) caused the engine to drop a rod through the oil pan. Since he is overseas, a Ford rep is keeping me "updated" by phone. They replaced the engine but are unable to find a converter, claiming the parts supplier went bankrupt. On the other hand, I have no problem finding converters advertised online. It's been 9 months!

Of All The Good Deeds You Do In Your Entire Life, This Just Might Be The Best.



Smile Train provides free cleft surgery which takes as little as 45 minutes and costs as little as \$250.

It gives desperate children not just a new smile—but a new life.

**“...one of the most
productive charities—
dollar for deed—
in the world.”**
—*The New York Times*

Your support can provide free treatment for poor children with clefts and other problems.

☐ \$250 Surgery. ☐ \$125 Half surgery. ☐ \$50 Medications. ☐ \$ _____

Mr./Mrs./Ms. _____

Address _____

City _____ State _____ Zip _____

Telephone _____ eMail _____

Credit card: ☐ Visa ☐ MasterCard ☐ AMEX ☐ Discover

Account No. _____ Exp. Date _____

Signature _____

☐ My check is enclosed.

**Smile Train-Dept. Mag.
P.O. Box 96211
Washington, DC 20090-6211**

Z09111053ZFHY11

Donate online: www.smiletrain.org or call: 800-932-9541



SmileTrain
Changing The World One Smile At A Time.

A Healthy Diet During Pregnancy Can Help Prevent Birth Defects And Clefts. Diet is an important part of pregnancy. Eat a healthy diet that contains lots of fruits and vegetables and foods fortified with folic acid. According to the U.S. Government, women who plan to have a child should be sure to take sufficient levels of folic acid (400 micrograms per day) during pregnancy to help prevent neural tube defects and reduce the risk for cleft lip and palate. When folic acid is taken one month before conception and throughout the first trimester, it has been proven to reduce the risk for neural tube defects by 50 to 70 per cent. Be sure to receive proper prenatal care, quit smoking, and follow your health care provider's guidelines for foods to avoid during pregnancy. Foods to avoid may include raw or undercooked seafood, beef, pork or poultry; delicatessen meats; fish that contain high levels of mercury; smoked seafood; fish exposed to industrial pollutants; raw shellfish or eggs; soft cheeses; unpasteurized milk; pâté; caffeine; alcohol; and unwashed vegetables. For more information, visit www.SmileTrain.org. The Smile Train is a 501 (c)(3) nonprofit recognized by the IRS, and all donations to The Smile Train are tax-deductible in accordance with IRS regulations. © 2009 The Smile Train.

My son is due home soon, and still no vehicle. Is Ford putting us on?

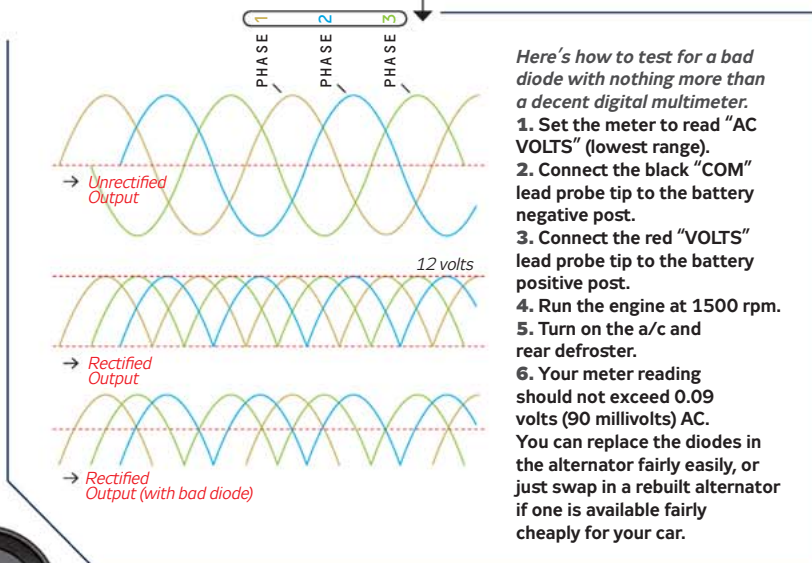
Ford has had difficulties keeping the Escape converter supply chain, partly because of a sketchy supplier, but also because of a lot of plugged converters. Continued operation with a plugged converter builds so much heat and back pressure, it can ultimately take out the bottom end of the engine. But I dare say you've been waiting longer than most.

Six months is way too long for a car to be down, regardless of whether your son is on deployment and doesn't really need it. It's time to start researching your state's lemon laws. Because the vehicle has been out of service so long, the dealership will almost certainly have to buy it back, if you make the right noises. Mind you, the deal will include paying Ford for the mileage that has accumulated, which often means the outcome probably won't be a bargain. Usually, just threatening to invoke the lemon law (which starts with arbitration, not court) makes the dealership get off the dime and either fix the vehicle

or find a replacement. I suggest you discuss this with your attorney.

Don't Give Me Any Static

When I turn on the rear-window defroster, I hear static on my radio. I now notice static when I use the air conditioning too. Is there something common between both systems that may be causing this?



ENVIRONMENTAL NEWS

The New R Rating

A/C INDUSTRY PLANS SHIFT TO NEW, LOW-IMPACT REFRIGERANT.

Fifteen years ago, the auto industry was forced to drop CFC-based refrigerant R-12 because of its liability for ozone depletion. They switched to non-CFC-based R-134a, which, as it turned out, also provided a substantial reduction in greenhouse gas liability. How much better is R-134a? Carbon dioxide has a global warming rating of 1. R-12 has a rating of 12,000. In other words, one pound of R-12 has the equivalent effect on global warming as 6 tons—12,000 pounds—of CO₂. Years ago, that made R-134a's rating of 1400 seem like a better deal.

(As a point of reference, it takes one or two pounds of CO₂ to dispense an entire keg of beer). But now automakers are considering a new refrigerant for worldwide use—R-1234yf. This new refrigerant has a global-warming impact number of just 4.

There is no intent to retrofit R-134a systems with the new R-1234yf, in the way many R-12 systems were haphazardly converted to R-134a. R-134a will remain available to service existing systems, and R-1234yf systems will use specific fittings, which should minimize accidental mixing of

the two refrigerants. R-1234yf is slightly less efficient than R-134a. Of course, R-134a is less efficient than R-12, and auto manufacturers had to modify and upgrade systems to maintain good cooling performance when the last changeover was mandated. They'll need to do so again.

R-1234yf will first appear in all-new European vehicles, so we might see some R-1234yf systems here by late 2011, with significant numbers starting in 2012.

Although R-134a continues to be available in small cans to DIYers,

California will soon require self-sealing can valves and large deposit fees to encourage recycling of any leftover refrigerant in partially used cans. Whether R-1234yf will also be available in small cans is uncertain. Pro technicians are legally required to recover, recycle and reuse all auto a/c refrigerants. And that means that repair shops will have to purchase yet another expensive recycling machine for R-1234yf and inventory a larger collection of fittings and replacement parts, costs ultimately passed on to consumers. —PAUL WEISSLER



ROCKLER®

WOODWORKING AND HARDWARE

Create with Confidence™



Lift, grip and protect your projects



26357
Four cookies,
just \$11.99

Our new **Bench Cookies** are revolutionizing the workshop, allowing for stable routing, sanding, carving and other tasks without traditional clamps. The secret? Non-marring rubber pads that solidly grip both the bench and your workpiece. They also elevate your projects for complete access to every edge, making finishing and edge work easy. Sturdy and simple to set up, **Bench Cookies** are guaranteed to help you **Create with Confidence**.



For a store near you or free catalog visit

Rockler.com | 1-877-ROCKLER

with a small AC ripple. Most of the time, the battery will still provide clean DC. But turn on a large power consumer like the a/c or defroster—20 amps or more—and the current available to the radio acquires a sawtooth shape, and you've got buzzing.

Wet Injector

I have a 1985 Honda CRX Si with a 1.5-liter fuel-injected engine. The problem: It restarts poorly and runs roughly, at least if I try to restart before it sits for 12 to 18 hours or more. It cranks over fine but takes a few seconds to fire up. If I hold the throttle open it helps the car to start quicker. The fuel injectors are rebuilt and balanced and said not to be leaking down. The coolant-temp sending unit is new, the air-temp sending unit is new, and there are no warning lights. I have a new fuel pump, a new oxygen sensor

and a clean air filter too. Once the engine starts, it runs roughly for 10 to 15 seconds, then smooths out and runs great. Holding the pedal down to the floor seems to help. Note: In very cold weather, say 32 degrees or below, it always starts fine. No one has yet been able to diagnose the trouble successfully.

In spite of your assertion that the injectors don't leak, this sounds like a leaky injector is fuel-fouling one cylinder. After you tease the engine to life on the other three cylinders, the extra fuel evaporates and then the plug starts firing. There are two tipoffs that this is the problem: the rough running until the wet plug dries off and starts to contribute, and the fact that waiting a half-day or more lets the excess fuel dissipate on its own. If you wait long enough before trying to restart, the extra fuel evaporates. Cranking with the throttle open makes the excess fuel dissipate quicker.

Check the dipstick. Does the oil smell like unburned fuel? It's likely that the dripping fuel is washing past the rings and into the crankcase. Run the car for long enough to get the engine hot. Then park it for 2 hours or so, until it cools off and you know it will be hard to start. Crank the engine for a few seconds and immediately shut it off. Then pull the plugs. I'll bet one of them is wet with fuel—and that's your bad injector. If you need proof, swap two injectors, and the fouled plug will follow.

Another check is to put a pressure gauge on the fuel rail, and see if it holds residual pressure after shutoff. If it does, then the injectors aren't leaking down.

Gear Jammin'

A while ago the transmission on my pickup became difficult to shift, as if the gears wanted to clash. This condition would go away and then return for several weeks at a time. One day, I could not shift into gear at all. Only by double-clutching the transmission was I sometimes able to

"The Quickest Car That Will Ever be Built in Your Garage."

GTM Supercar kit \$19,990

CAR-DRIVER



Factory Five has lead the component car industry in quality, engineering, performance, and value since 1995. If you're considering building your own custom car, consider that more people build Factory Fives than any other component car. **Free DVD/brochure 508-291-3443 or visit www.factoryfive.com.**



Factory Five Racing
www.factoryfive.com



65 Coupe kit \$14,990



Mk3 Roadster kit \$12,990



'33 Hot Rod kit \$19,990

See the world in high definition!

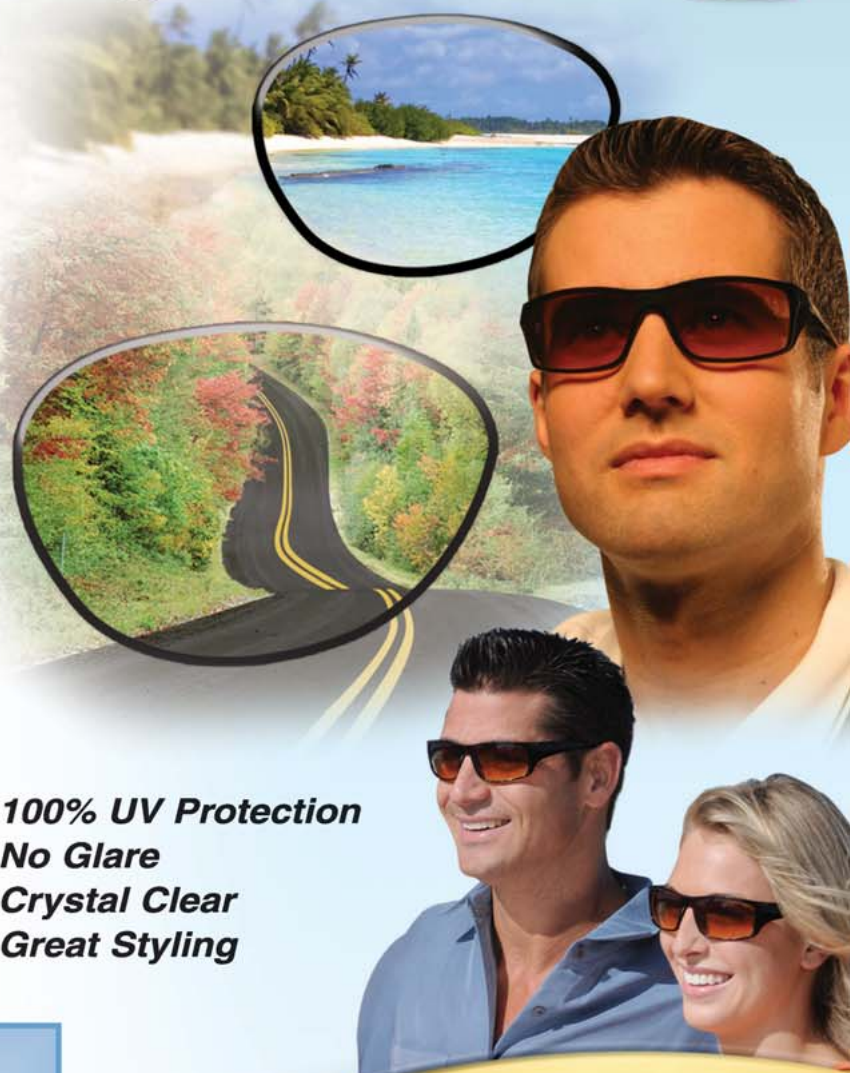


Why pay \$100 or more for sunglasses that just makes things darker? Introducing HD VISION ULTRAS, the first sunglasses that not only block glare and ultraviolet rays, but also make colors come alive! Wearing them is like discovering the world for the first time. Everything looks crisper and more radiant. Things normally drowned out by the sun spring sharply into view. That means they're perfect for:

- Days at the beach
- Driving
- Fishing and boating
- Sporting events
- And so much more!

But the best part is the price! You won't pay \$100 or even \$50. Through this special offer, we are going to be giving away HD Vision Ultras for just \$10! As a special bonus, you'll get a second pair of ULTRAS free with every pair you buy (just pay additional shipping and handling). That's two pairs for just \$10!

- 100% UV Protection
- No Glare
- Crystal Clear
- Great Styling



How To Get Yours

1. Phone: Call toll-free: **1-800-635-7059**

2. Web: Type this special address into your browser: **tryhdvision.com/MEC**

3. Mail: Send a check or money order made out to "HD Ultra" for \$16.99 (includes S&H) plus *\$6.99 S&H for 2nd set to: HD Ultra Offer MEC, PO Box 4525, Pacoima, CA 91333.

NJ and CA residents MUST add sales tax.
© 2009 Ideavillage. Allow 4-6 weeks for delivery.



Also available in Tortoise

Call 1-800-635-7059 or visit tryhdvision.com/MEC



He was a hardworking farm boy.

She was an Italian supermodel.

He knew he would have just one chance to impress her.

Rosetta Stone. The fastest and easiest way to learn ITALIAN.

Rosetta Stone® brings you a complete language-learning solution, wherever you are: at home, in-the-car or on-the-go. You'll learn quickly and effectively, without translation or memorization. You'll discover our method, which keeps you excited to learn more and more.

- You'll experience **Dynamic Immersion®** as you match real-world images to words spoken by native speakers so you'll find yourself engaged and learn your second language like you learned your first.
- Our proprietary **Speech Recognition Technology** evaluates your speech and coaches you on more accurate pronunciation. You'll speak naturally.
- Only Rosetta Stone has **Adaptive Recall®**, that brings back material to help you where you need it most, for more effective progress.
- And Rosetta Stone includes **Audio Companion®** so that you can take the Rosetta Stone experience anywhere you use a CD or MP3 player.

Innovative software. Immersive method. Complete mobility. It's the total solution. Get Rosetta Stone — **The Fastest Way to Learn a Language. Guaranteed!**

Call
(800) 306-1377

Online
RosettaStone.com/pms119

Use promotional code **pms119** when ordering.

Offer expires February 28, 2010.



31 Languages Available

SAVE 10%!

**100% GUARANTEED
SIX-MONTH MONEY-BACK**

Level 1	Reg. \$229	NOW \$206
Level 1, 2 & 3	Reg. \$499	NOW \$449

©2008 Rosetta Stone Ltd. All rights reserved. Offer applies to Personal Edition only. Patent rights pending. Offer cannot be combined with any other offer. Prices subject to change without notice. Six-Month Money-Back Guarantee is limited to product purchases made directly from Rosetta Stone and does not include return shipping. Guarantee does not apply to an online subscription or to Audio Companion purchased separately from the CD-ROM product. All materials included with the product at the time of purchase must be returned together and undamaged to be eligible for any exchange or refund.

RosettaStone®

WeatherTech® Automotive Accessories

Ford Focus



FloorLiner™ is made from a Sturdy High-Density Tri-Extruded Material, and is Laser Measured to Perfectly Fit Your Vehicle! Available for Popular Cars, Trucks, SUVs and Minivans in Black, Tan or Gray.

Accessories available for:

Acura • Audi • BMW • Buick • Cadillac • Chevrolet • Chrysler • Dodge • Ford • Ferrari • GMC • Honda • Hummer • Hyundai • Infiniti • Isuzu • Jaguar • Jeep • Kia • Land Rover • Lexus • Lincoln • Maserati • Mazda • Mercedes-Benz • Mercury • Mini • Mitsubishi • Nissan • Oldsmobile • Plymouth • Pontiac • Porsche • Saab • Saturn • Scion • Subaru • Suzuki • Toyota • Volkswagen • Volvo • And More!

They just
snap right in!



Chrysler Town & Country

Toyota Highlander



Cargo-Trunk Liner Computer Designed Protection for Cars, SUVs and Minivans. Available in Black, Tan or Gray.

Side Window Deflectors for Virtually Any Car, Pickup, SUV or Minivan! No Exterior Tape Needed. Also Available in Dark Tint.



Chevy Impala

All-Weather Floor Mats for Virtually Any Car, Pickup, SUV or Minivan! Available in Black, Tan or Gray.

MacNeil
AUTOMOTIVE
PRODUCTS LIMITED

Specialists in Original Equipment and Aftermarket Automotive Accessories

Order by Phone or Internet

800-441-6287

See and
Order Everything at
WeatherTech.com

2435 Wisconsin Street • Downers Grove, IL 60515 • 630-769-1500 • fax 630-769-0300

©2009 MacNeil Automotive Products Limited

get the truck into gear. I jacked the truck up and ran it through the gears, and noticed the truck was engaged in a forward gear when the shifter was in neutral. This problem went away on its own, and I regained the ability to upshift, however, I still need to double-clutch to downshift.

Oftentimes, a poorly adjusted clutch, or even a disintegrating clutch disc, can cause difficulty changing gears. The next most likely scenario is a bad pilot-shaft bearing. Specifically, the transmission input shaft goes through the center of the clutch disc and into a bearing at the center of the flywheel. When that bearing fails, it tries to spin the tranny input shaft even when the clutch pedal is depressed and the transmission and drivetrain are supposed to be disengaged from the engine.

However—you say that the transmission was engaged even in neutral. The viscosity of the lubricant in the transmission will make the rear wheels spin weakly in neutral when the engine is idling, but I assume you mean that the wheels were locked to the engine in neutral. If so, you have a failed bearing between the transmission input and output shaft.

Actually, it really doesn't matter. Regardless of what has failed, the transmission has to be removed to access the clutch, flywheel or transmission internals. Once the trans is out of the truck, it should be obvious where the problem is.

Squeezed

I live in Arizona and use 87-octane regular. In Utah, Idaho and Nevada, stations were selling 85-octane as regular gas. This forced me to pay more for midgrade 87-octane. Is this the latest petroleum-industry scam to get more of our money? Will my car run okay on this bogus 85-octane regular?

Octane is the ability of a fuel to resist knock, and high-compression engines tend to knock more. The obverse of that is that lower-compression engines can run on lower-octane gas. Air is thinner the higher above sea level you go. Less air going into the cylinders means less pressure at top dead center when things go bang. It's a lot like lowering

the compression ratio in the engine, reducing the need for high octane. Cars will run just fine on lower-octane fuel when they're well above sea level—and all of those states are. Hopefully, by the time you get back down to denser air, you've burned off most of the low-octane stuff, and can refill the tank with higher-grade fuel.

PM



Make Money In Metal Art

- Make Artistic Projects and Mechanical Parts
- Includes Industry-Leading Software
- Simple to Operate - Runs Off Your Computer

"PlasmaCAM is a well thought-out tool. The software is incredible. I can quickly go from concept to a finished part. I haven't seen anything we can't do with this machine. It has saved us so much time and effort, it's just incredible!"

-Jim, Custom Turbo Engineering

PO Box 19818 • 5112 Graneros Rd.
Colorado City, CO 81019
www.plasmacam.com
(719) 676-2700 • fax (719) 676-2710

PlasmaCAM Inc.



How I Found The Gold Coin That Never Was

And how readers can take advantage of my major gold discovery!

by Nick Bruyer

Over a thousand years ago my Viking Warrior ancestors raided the coast of England in their great longships, striking terror into the hearts of their victims. But some of them stayed and settled on the Isle of Man, situated between England, Ireland and Scotland. It was during a visit to this ancient Isle that I stumbled onto something amazing—a precious piece of history that you can own and pass down through generations of your own family as a gold treasure of lasting value.

The Gold Coin That Never Was

As president of an international coin distributor, GovMint.com, I knew that the Isle of Man has its own legal tender coins. So I made a journey to the mint to meet the Mint Master. I was lamenting the fact that there was no gold coin commemorating their Viking heritage, when he told me that such a coin had been authorized, but never minted. The Twentieth Noble was to be struck in 99.99% fine gold. When I asked why it had never been minted, he didn't know. The Mint's official archives did not give a reason, but they revealed a startling fact.

I Seize a Golden Opportunity

The archives revealed the Government had given the Mint Master the authority to strike the Viking Gold Nobles *at any time*. When I asked if the Mint would strike them now, he agreed, but only if I would purchase the entire mintage. I could hardly believe my good fortune—it was like a dream come true.

The Viking Longboat Gold Noble—Available for the First Time

The Gold Noble depicts a Viking longboat in spectacular frosted relief against a deeply mirrored background.



Actual size
is 15 mm



It is double-struck as a Gem Proof, with the flawless surfaces coveted by collectors. As a FIRST-EVER gold coin it is sure to be sought-after.

Other First-Ever Coins Have Become Highly Prized

First year one ounce China Gold Panda coins were issued in 1982 for less than \$400 each, but today they sell for \$2,999* each. The first year 1980 one-tenth ounce Proof Krugerrand, sells for up to 20 times more than its gold value. There is no telling what could happen to the value of this Viking Gold Noble in years to come, but you're getting in on the ground floor because *this coin does not yet exist in the collectors market.*

Complete Sellout Expected

In times of economic uncertainty, historically, nothing gives peace of mind like gold, and the collector value of this first ever Viking Gold Noble ensures that the coins in this limited edition will sell out rapidly.

Due to the limited supply, orders must be accepted on a first-come, first-served basis at the low original issue price of only \$149.95 each (plus s&h).

Order 3 or more at just \$144.95 each (plus s&h) for even greater savings.

In order to be fair to all our readers, there is a strict limit of no more than five Viking Gold Nobles per customer. Call toll-free 24 hours a day, 7 days a week 1-888-201-7070 request offer code VGN122 to secure your Viking Gold Nobles.

Buy More to Save More!

Buy 3 Viking Gold Nobles for \$144.95 each plus s/h YOU SAVE \$15!

Buy 5 Viking Gold Nobles for \$139.95 each plus s/h YOU SAVE \$50!

Order Risk-Free! Your Viking Gold Noble comes with a Certificate of Authenticity and a Full 30-day Satisfaction Guarantee.

Nicholas Bruyer is an award-winning professional numismatist and author with more than 30 years of coin market experience. Since 1985, tens of thousands of satisfied customers have acquired over \$400 million in coins from his companies. Note: GovMint.com is a private distributor of government and private coin and medallion issues and is not affiliated with the United States Government. Prices and availability subject to change without notice.

©GovMint.com, 2009

*All values were accurate at time of printing

→ DUSTING OUT YOUR SLR + APPLE'S MISSING EJECT BUTTON

DIY Tech



The Beauty of Ethernet Cable

CREATING A HIGH-SPEED, HARD-WIRED HOME NETWORK IS EASIER—AND MORE AFFORDABLE—THAN YOU THINK.

BY ANTHONY VERDUCCI

➔ **At some point** in its history, the humble RJ-45 Ethernet connector got a bad rap. Wi-Fi routers entranced us all with their promise of easy setup and constant connectivity, while wired Ethernet connections required a mystical knowledge closely guarded by corporate IT professionals. Now, we've got nothing against Wi-Fi—for devices such as smartphones and laptops that put a premium on portability, it's the natural solution. But it turns out that nothing beats a hard-wired connection for setup simplicity, reliability and speed.

Advanced Wi-Fi gear has a top-end bandwidth of 600 megabits per second (in practice, many Wi-Fi setups

operate far more slowly), whereas wired connections can shuttle data around at up to 1000 Mbps, or 1 gigabit per second, consistently—great for bandwidth-hogging HD video streaming. Plus, wired Ethernet gear requires no passwords, encryption or complex alphanumeric keys to set up—all the equipment is plug-and-play.

Meanwhile, the home network is evolving from a novelty to a necessity. Many families now have multiple computers as well as a constellation of connected devices such as game systems, network-attached storage drives, printers, security cameras and media players. Some of these have Wi-Fi connectivity, but almost all of them have an RJ-45 Ethernet jack built in. These networked devices are swiftly colonizing every room in the house. Just as phone jacks and coaxial cable connections have evolved to become standard build-in connections during remodeling or new construction, Ethernet is now the new must-have outlet. And contrary to what you might expect, Ethernet is about as simple and inexpensive as wiring gets—about \$200 will cover all the equipment and supplies you need for an entire house.

Beneath the Sheath

→ **It's easy to see why** people are intimidated by Ethernet cable. Slice open the exterior plastic sheath and eight tiny multicolored wires spill out like a many-headed hydra. And the variety of cable standards is downright inscrutable: CAT 5, CAT 5e, CAT 6, CAT 6a and so on. Category 5, or CAT 5, cable is used for basic 10/100 Mbps networking, while CAT 5e and CAT 6 can support gigabit equipment known as 1000 Base T. But CAT 6 is necessary to support the less widely used 1000 Base TX gear, while CAT 6a cable supports corporate-level networking gear at speeds up to 10 Gbps. Sounds confusing, but the average homeowner will be fine with CAT 5e (the "e" stands for enhanced), which supports all the most common consumer equip-

ment and can carry signal to a maximum cable distance of 330 feet. If you're wiring an entire house, you'll want to buy your cable in bulk. Online retailer Sewell Direct sells a soup-to-nuts kit, including 1000 feet of CAT 5e, a stripping/crimping tool and 100 connectors, for \$85.

Of course, when you buy bulk cable, you're going to have to attach the connectors yourself, but there's no advanced degree required for crimping. Just follow the U.S. standard wiring code (known as T568B). From left to right, align the wires—orange stripe, solid orange, green stripe, solid blue, blue stripe, solid green, brown stripe, solid brown—then slide them into the connector (clip side down) and crimp with your crimping tool. Sound too complicated? Here's a dirty little secret of the Ethernet world: Even if you get the order of the wiring wrong, it doesn't matter—so long as your wiring is consistent on both ends, the signal will go through.

Plan Your Route

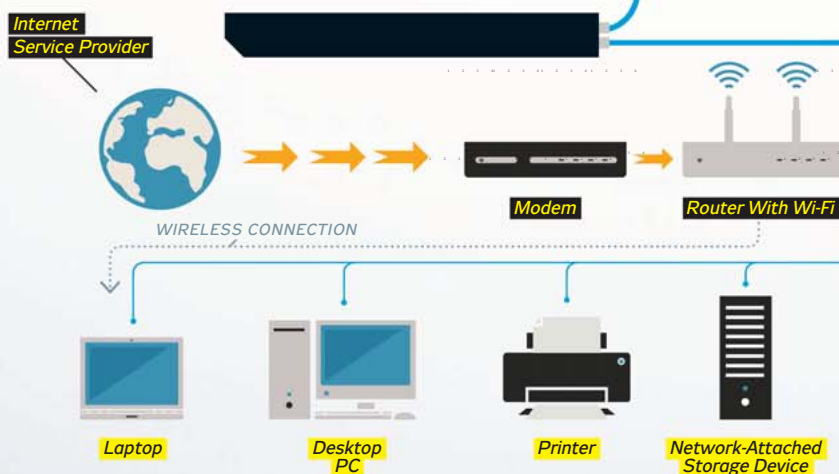
→ **But before you start** stringing wire all over your house and potentially tearing up your walls, do a little detective work. Look around the house for pre-existing holes and pathways that will help you route the wire more easily. Draw out a rough blueprint for your house and plot the most efficient routing path for your network—use your attic, basement and/or crawlspaces to

move wire from one room to the next. Think hard about what pieces of equipment need to be networked and where these devices are located, and plan for the future; young children may eventually need connectivity in their rooms, networked devices will gradually find their way into your kitchen, and, heck, someday you might build that home theater in the basement. I even sent my network into my bathroom.

Remember, your network diagram begins with your broadband modem, then progresses to a router, which serves as the traffic manager for your entire network. If you already have a Wi-Fi hotspot in your house, keep in mind that many of these devices do double duty as wired routers, and typically have four

RJ-45 ports on the back for wired network connections. Past the router, you can use simple Ethernet switches to split your network into as many branches as you wish. Switches can have anywhere from four to 48 ports, and are far less complex than routers—setup is as easy as plugging the switch into an electrical outlet, then plugging in

DRAW IT OUT
Before snipping a single cable, inventory the networkable gear in your home. Create a diagram to determine the most efficient routing path for your wire. Think of wired Ethernet and Wi-Fi as complementary technologies. Portable devices such as laptops and smartphones can tap into the wireless system, while stationary devices that require more robust connections plug directly into the network.



Buying cable in bulk saves serious cash. For 1000 feet of cable, expect to pay between \$50 and \$80.

all of your Ethernet cords, like an electrical power strip for networking. That said, routers and switches are powered digital devices, so some locations—basements, attics and closets—may get too hot or too damp, or may not have an easily accessible electrical outlet.

As to the specifics of routing signal cable such as CAT 5e or CAT 6, check local building codes, but with low-voltage wiring there generally aren't many restrictions. From my experience, however, it's a good idea to space any Ethernet wall outlets at least 1 foot from electrical boxes to avoid interference.

And when you get around to actually installing your cable, standard wiring procedure applies: Use a stud finder to plan around your framing. If you are installing in an existing wall, use an old-work electrical box or low-voltage bracket and mount a network faceplate to it, then fish the wires through the wall to your outlet using a drop chain or fish tape. If drilling holes, snaking wires, and mounting outlets and boxes throughout the house doesn't appeal to you, do what the cable companies do and run the cables through closets and along your baseboards.

When you are done, don't forget to keep a stock of extra cable, connectors and tools, as you may end up extending or reconfiguring the network as your needs grow. Plus, once you show your friends and family that there's no need to fear the RJ-45 connector, they may want to borrow a bit of your mystical IT knowledge—and all of your extra supplies, of course.

PM



THREE-STEP CABLE-MAKING GUIDE



1 Strip off about ½ inch of the cable jacket and untwist the eight wires. Check for damage before proceeding.



2 Arrange the wires in the proper order (orange stripe, solid orange, green stripe, solid blue, blue stripe, solid green, brown stripe, solid brown) and slide on the RJ-45 connector.



3 Crimp and repeat the process at the other end.

Wire
Crimper



Ethernet Switch



HDTV



Game
System



Blu-ray
Player

ONE PART STRONG ONE PART TOUGH



Gorilla Epoxy's gap-filling capabilities and all purpose formula easily bonds steel, wood, aluminum, ceramic and more. Sets in just 5 minutes.

FOR THE TOUGHEST JOBS ON PLANET EARTH®

GORILLATOUGH.COM

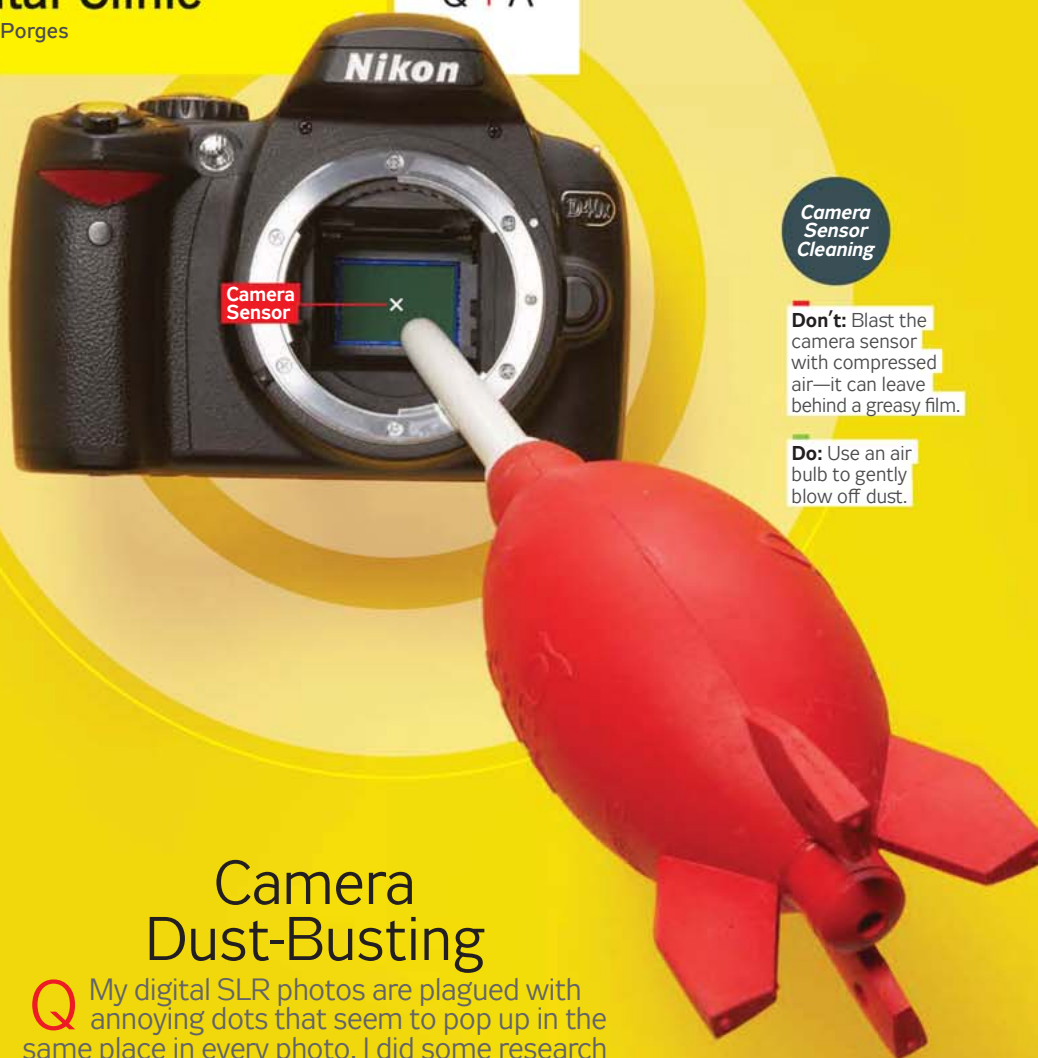
1-800-966-3458 Made in U.S.A.

© 2009 Gorilla Glue Company

Digital Clinic

by Seth Porges

Q + A



Camera Sensor Cleaning

Don't: Blast the camera sensor with compressed air—it can leave behind a greasy film.

Do: Use an air bulb to gently blow off dust.

Camera Dust-Busting

Q My digital SLR photos are plagued with annoying dots that seem to pop up in the same place in every photo. I did some research and suspect they are caused by dust on my camera's image sensor. How can I clean it?

A Digital SLR cameras with interchangeable lenses are highly versatile, but they have a unique vulnerability: When the lens is removed, the door is open for dust to float into the camera's body and cling to the electrically charged image sensor within. Once there, these tiny specs of dust can pollute your photos with annoying, image-ruining artifacts that usually pop up in the same place from

photo to photo. Freckles, some photographers call them.

To combat this problem, digital SLR manufacturers have begun to build cameras with the ability to clean their own sensors. This is typically done through a vibration mechanism—the sensor literally shakes the dust loose. But if your camera can't do this, or if you aren't inclined to spend the time and money needed to send

it to a professional service center for cleaning, it may be prudent to do the dust-busting yourself.

There are a number of ways to clean an image sensor, but it's important to take it easy. Camera sensors are extremely fragile, and while some of the more aggressive cleaning methods may certainly rid the sensor of dust, they're also likely to result in collateral damage. For example, blasting

Choose Life Grow Young with HGH

From the landmark book *Grow Young with HGH* comes the most powerful, over-the-counter health supplement in the history of man. Human growth hormone was first discovered in 1920 and has long been thought by the medical community to be necessary only to stimulate the body to full adult size and therefore unnecessary past the age of 20. Recent studies, however, have overturned this notion completely, discovering instead that the natural decline of Human Growth Hormone (HGH), from ages 21 to 61 (the average age at which there is only a trace left in the body) and is the main reason why the the body ages and fails to regenerate itself to its 25 year-old biological age.

Like a picked flower cut from the source, we gradually wilt physically and mentally and become vulnerable to a host of degenerative diseases, that we simply weren't susceptible to in our early adult years.

Modern medical science now regards aging as a disease that is treatable and preventable and that "aging", the disease, is actually accumulation of various diseases and pathologies, from everything, like a rise in blood glucose and pressure to diabetes, skin wrinkling and so on. All of these aging symptoms can be stopped and rolled back by maintaining Growth Hormone levels in the blood at the same levels HGH existed in the blood when we were 25 years old.

There is a receptor site in almost every cell in the human body for HGH, so its regenerative and healing effects are very comprehensive.

Growth Hormone first synthesized in 1985 under the Reagan Orphan drug act, to treat dwarfism, was quickly recognized to stop aging in its tracks and reverse it to a remarkable degree. Since then, only the lucky and the rich have had access to it at the cost of \$20,000 US per year.

Many in Hollywood's glamour sets, who never seem to age like you or I, have a special secret to tell, and even space pioneer and US Senator John Glen stays vital with HGH.

The next big breakthrough was to come in 1997 when a group of doctors and scientists, developed an all-natural source product which would cause your own natural HGH to be released again and do all the remarkable things it did for you in your 20's. Now available to every adult for about the price of a coffee and donut a day.

GHR now available in America, just in time for the aging Baby Boomers and everyone else from age 30 to 90 who doesn't want to age rapidly but would rather stay young, beautiful and healthy all of the time.

The new HGH releasers are winning converts from the synthetic HGH users as well, since GHR is just as effective, is oral instead of self-injectable and is very affordable.

GHR is a natural releaser, has no known side effects, unlike the synthetic version and has no known drug interactions. Progressive doctors admit that this is the direction medicine is seeking to go, to get the body to heal itself instead of employing drugs. GHR is truly a revolutionary paradigm shift in medicine and, like any modern leap frog advance, many others will be left in the dust holding their limited, or useless drugs and remedies.

It is now thought that HGH is so comprehensive in its healing and regenerative powers that it is today, where the computer industry was twenty years ago, that it will displace so many prescription and non-prescription drugs and health remedies that it is staggering to think of.

The president of BIE Health Products stated in a recent interview, I've been waiting for these products since the 70's. We knew they would come, if only we could stay healthy and live long enough to see them! If you want to stay on top of your game, physically and mentally as you age, this product is a boon, especially for the highly skilled professionals who have made large investments in their education, and experience. Also with the failure of Congress to honor our seniors with pharmaceutical coverage policy, it's more important than ever to take pro-active steps to safeguard your health. Continued use of GHR will make a radical difference in your health, HGH is particularly helpful to the elderly who, given a choice, would rather stay independent in their own home, strong healthy and alert enough to manage their own affairs, exercise and stay involved in their communities. Frank, age 85 walks two miles a day, plays golf, belongs to a dance club for seniors, has a girl friend again and doesn't need Viagra, passed his drivers test and is hardly ever home when we call - GHR delivers.

HGH is known to reverse Hemorrhoids, Autoimmune Diseases, Macular Degeneration, Cataracts, Fibromyalgia, Angina, Chronic Fatigue, Diabetic-neuropathy, Hepatitis C, Chronic Constipation, High Blood Pressure, Sciatica, Asthma and Menopause symptoms, helps Kidney Dialysis, and heart and stroke recovery.

For more information or to order call 877-849-4777

www.biehealth.us

©copyright 2000

New! Doctor
Recommended

The Reverse Aging Miracle

RELEASE YOUR OWN GROWTH HORMONE AND ENJOY:

- Improved sleep & emotional stability
- Increased energy & exercise endurance
- Loss of body fat
- Increased bone density
- Improved memory & mental alertness
- Increased sexual potency
- Increased muscle strength & size
- Reverse baldness & color restored
- **Regenerates Immune System**
- Strengthened heart muscle
- Controlled cholesterol
- **Normalizes blood pressure**
- Controlled mood swings
- Wrinkle disappearance
- Reverse many degenerative disease symptoms
- Heightened five senses awareness
- Increased skin thickness & texture

All Natural
Formula

This program will make a radical difference in your health, appearance and outlook. In fact we are so confident of the difference GHR can make in your life we offer a 100% refund on unopened containers.

1-877-849-4777

www.biehealth.us

BIE Health Products
3840 East Robinson Road
Box 139
Amherst, NY 14228

GHR

DIV 2037839 ON



NOTICE OF VOTING RIGHTS AND HEARING TO CONSIDER WHETHER TO CONFIRM THE PLAN OF REORGANIZATION OF PITTSBURGH CORNING CORPORATION

PITTSBURGH CORNING CORPORATION ("PCC") has proposed a Modified Third Amended Plan of Reorganization (the "Plan"). Those with claims against PCC; those with asbestos personal injury claims (as defined in the Plan) against PCC or its parent corporations, **PPG INDUSTRIES, INC. ("PPG")** or **CORNING INCORPORATED ("Corning")** can vote to accept or reject the Plan by **November 16, 2009**. The United States Bankruptcy Court for the Western District of Pennsylvania (the "Court") will consider whether to confirm the Plan at a hearing starting **January 11, 2010**.

A Solicitation Package containing detailed information and ballots for voting on the Plan has been sent to all known claimants or their lawyers, and is available as described below.

KEY ELEMENTS OF THE PLAN

The Plan proposes to create a trust to pay asbestos personal injury claims arising from exposure to a former PCC product called Unibestos. An injunction under section 524(g) of the Bankruptcy Code will result in the permanent channeling of asbestos personal injury claims against PCC or any Asbestos Protected Party (as defined in the Plan). This injunction will prohibit people with asbestos personal injury claims from suing the parties protected by the injunction. If you think you may have such an asbestos personal injury claim, you should read the Disclosure Statement and Plan carefully for details about how your rights may be affected.

VOTING ON THE PLAN

There is information in the Solicitation Package that describes exactly who can vote and how to vote. You do not have to vote, but you are encouraged to do so if you are eligible. To be counted, a ballot **must be received by the Voting Agent by 5:00 p.m. (Eastern Time) on November 16, 2009**.

THE HEARING ON THE PLAN

A hearing to consider confirmation of the Plan will begin before Judge Judith K. Fitzgerald at the **U.S. Bankruptcy Court, Western District of Pennsylvania, in Courtroom A, U.S. Steel Tower, 54th Floor, 600 Grant Street, Pittsburgh PA on January 11, 2010 at 9:30 a.m. (Eastern Time)**. You may attend the hearing but you are not required to do so. Objections, if any, must be **submitted in writing and filed with the Court by November 11, 2009**, as described in the Solicitation Package.

ADDITIONAL INFORMATION

If you believe that you have a claim against PCC, and you or your lawyer did not receive a Solicitation Package, you may obtain a Solicitation Package by calling the Voting Agent at (973) 509-3190, visiting www.asbestos-pcc.com or www.loganandco.com, or writing to Logan & Company at 546 Valley Road, Upper Montclair, NJ 07043.

PM DIY /// DIGITAL CLINIC Q+A

the sensor with compressed air can leave the camera's fragile innards coated with a greasy film from the can's accelerant.

My preferred method: Use an air bulb, such as the Giottos Rocket Blaster (pictured) or the Dot Line Hurricane Blower (both cost around \$10) to blow the dust away. These small rubber balls squeeze out a focused jet of air that is powerful enough to blow away most dust particles.

Before you perform the operation, you'll want to find a clean, dust-free area to work in. Next step: Gain access to the sensor. To do this, you'll need to remove the lens and select a menu function called something like "Lock Mirror Up for Cleaning" (the exact wording may differ depending on your camera model). When this mode is selected, a mirror inside the camera will flip up, revealing the glossy, rectangular sensor behind. This mode should also cut the dust-attracting electricity from the sensor, making it easier to remove the particles. Hold the bulb a few inches from the sensor and liberally squeeze away.

If stubborn dust specs prove unmoved by the air bulb, you can follow up with a swab-based cleaning tool and specially made cleaning solution, such as the Sensor Swab (\$45 for a pack of 12) and the Photographic Solutions Eclipse Sensor Cleaner (about \$10 for a 2-ounce bottle). Apply a small amount of the cleaning solution to the applicator stick's swab tip and carefully run it across the surface

of the sensor, much like you would run a squeegee over a window. Just don't apply too much pressure or you could damage the fragile sensor.

And remember, the best offense is a good defense; a few precautionary steps can minimize the chances of dust seeping inside your camera in the first place. When you swap lenses, try to do it as quickly as possible, in a clean, dust-free room, away from any wind. If you must do it outside, take the advice of PM photographer Chad Hunt, who recently battled dusty conditions in Afghanistan: "Dust has a hard time drifting straight up, so a lot of pro photographers hold the camera down when they take off the lens so the opening is facing the ground."

Open Sesame

My Mac Pro tower computer doesn't seem to have an eject button for its CD/DVD drive.

Apparently, the button is on the keyboard that it came with. Trouble is, I don't use that keyboard. Is there any other way to open the drive?

Like many Apple products, the monolithic Mac Pro tower (along with some of its predecessors) was designed with as few physical buttons as possible. One element that was sacrificed by Apple's designers on the altar of minimalism: the eject button. The tower doesn't have one. Of course, this presents a problem for users who don't use an Apple-issued keyboard or one of the few third-party keyboards with an eject button, for whom there

Popular Mechanics (ISSN 0032-4558) is published 12 times a year by Hearst Communications, Inc., 300 West 57th Street, New York, NY 10019, U.S.A. Frank A. Bennack, President and Chief Executive Officer; Catherine A. Bostrom, Secretary; Ronald J. Doerfler, Senior Vice President, Chief Financial Officer and Treasurer; Hearst Magazines Division: Cathleen P. Black, President and Group Head; John P. Loughlin, Executive Vice President and General Manager; John A. Rohan, Jr., Vice President and Group Controller. © 2009 by Hearst Communications, Inc. All rights reserved. Popular Mechanics is a registered trademark of Hearst Communications, Inc. Periodicals postage paid at NY, N.Y., and additional entry post offices. Canada Post International Publications Mail Product (Canadian distribution) sales agreement no. 40012499. CANADA BN NBR 10231 0943 RT. POSTMASTER: Send address changes to Popular Mechanics, P.O. Box 7186, Red Oak, IA 51591. Printed in U.S.A.

EDITORIAL AND ADVERTISING OFFICES:
300 West 57th Street,
New York, NY 10019-3797.

SUBSCRIPTION SERVICES:
Popular Mechanics will, upon receipt of a complete subscription order, undertake fulfillment of that order so as to provide the first copy for delivery by the Postal Service or alternate carrier within 6-14 weeks.

>>> Subscription prices: United States and possessions: \$24.00 - for one year. Canada and all other countries: \$40.00 - for one year. >>> Should you have any problem with your subscription, please write to Customer Service Department, Popular Mechanics, P.O. Box 7186, Red Oak, IA

51591. Please enclose your mailing label when writing to us or renewing your subscription. >>> Popular Mechanics is not responsible for unsolicited manuscripts or art. None will be returned unless accompanied by a self-addressed stamped envelope. Unsolicited manuscripts and photographs will not be returned unless accompanied by return postage and envelope.

MAILING LISTS:
From time to time we make our subscriber list available to companies who sell goods and services by mail that we believe would interest our readers. If you would rather not receive such mailings, please send your current mailing label or exact

copy to: Popular Mechanics, Mail Preference Service, P.O. Box 7024, Red Oak, IA 51591-0024.

AS A SERVICE TO READERS,

Popular Mechanics publishes newsworthy products, techniques and scientific and technological developments. Due to possible variance in the quality and condition of materials and workmanship, Popular Mechanics cannot assume responsibility for proper application of techniques or proper and safe functioning of manufactured products or reader-built projects resulting from information published in this magazine.

tech term

OLEOPHOBIC SCREEN

Like other glass surfaces, touchscreen displays are magnets for fingerprints. To combat these streaks, gadget manufacturers have begun building devices with so-called oleophobic, or oil-resistant, screens. The effect comes from an oil-averse polymer that is bonded to the screen, preventing smears from sticking to the glass. They aren't perfectly smudge-free, but because the oil simply sits on the surface of the glass, it is far easier to wipe away.

is simply no obvious way to open an empty drive.

Thankfully, there are a number of work-arounds. One is to permanently install an eject icon in the toolbar menu situated at the top of your desktop. To do this, open up a Finder window and click "Macintosh HD." Then click "System," followed by "Library," "CoreServices," "Menu Extras" and, lastly, "Eject.menu." An eject icon will now appear at the top right of your screen. If you ever want to remove it, just hold the command key on your keyboard and drag the icon off of the menu bar.

Another way to open the drive in a pinch: Open iTunes, click on "Controls," and select "Eject Disc." (There's also a shortcut for this operation within iTunes—just press command-E.) Or, if you are restarting your computer, holding down the mouse button during boot-up should do the trick.

PM



PROPERTY CARE WITHOUT THE HARD WORK. GUARANTEED!



Folds Up Flat for Storage!

The **Cyclone Rake XL™** hitches to nearly any riding mower and makes quick work of fall leaves and other yard debris. The patented **Miracle Impeller™** and **JetPath® Vacuum System** lift, vacuum and mulch everything as you drive. When the work is done, the Cyclone Rake folds up flat for easy storage without any tools. This year spend less time struggling with your property and more time enjoying it.

REQUEST A FREE CYCLONE RAKE CATALOG AND DVD TODAY!

CALL TOLL-FREE

1-888-324-1483

See It In Action at www.CycloneRakeDVD.com

Woodland Power Products, Inc., Dept. PM1109, 72 Acton St., West Haven, CT 06516

Chef'sChoice®

Diamond Hone® AngleSelect™ Knife Sharpener 1520

The World's Most Versatile Sharpener...in any language!



• Astonishing sharp edges for all your knives!

- ✓ Asian style - single and double 15° edge.
- ✓ Euro/American - household and kitchen 20° edge.
- ✓ Sports knives and pocket knives.
- ✓ Straight edge and serrated blades.

- Highly precise knife guides.
- More durable "Gothic Arch" edge.
- 100% diamond abrasives and patented flexible stropping disks for a super sharp, flawless edge.

The brand professionals trust for better than factory sharp edges.

EdgeCraft 610-268-0500 www.edgecraft.com

© EdgeCraft 2009, Avondale, PA 19311



Amish mantle and miracle invention help home heat bills hit rock bottom

Miracle heaters being given away free with orders for real Amish fireplace mantles to announce the invention that helps slash heat bills, but Amish craftsmen under strain of early Christmas rush force household limit of 2

Save money: only uses about 9¢ electric an hour; so turn down your thermostat and never be cold again

By MARK WOODS
Universal Media Syndicate

(UMS) Everyone hates high heat bills. But we're all sick and tired of simply turning down the thermostat and then being cold.

Well now, the popular HEAT SURGE® miracle heaters are actually being given away free to the general public for the next 7 days starting at precisely 8:00 a.m. today.

The only thing readers have to do is call the National Distribution Hotline before the 7-day deadline with their order for the handmade Amish Fireplace Mantle. Everyone who does is instantly being awarded the miracle heater absolutely free.

This is all happening to announce the HEAT SURGE Roll-n-Glow® Fireplace which actually rolls from room-to-room so you can turn down your thermostat and take the heat with you anywhere. That way, everyone who gets them first can immediately start saving on their heat bills.

Just in time for winter weather, portable Amish encased fireplaces are being delivered directly to the doors of all those who beat the deadline.

These remarkable fireplaces are being called a miracle because they have what's being called the *Fireless Flame*™ patented technology that gives you the peaceful flicker of a real fire but without any flames, fumes, smells, ashes or mess. Everyone is getting them because they require



GENUINE AMISH MANTLES MADE IN THE USA: Everyone wants to save money on heat bills this winter, so entire Amish communities are working from the crack of dawn to finish. These fine real wood Amish made fireplace mantles are built to last forever. The oak mantle is a real steal at just two hundred ninety-eight dollars because all those who beat the order deadline by calling the National Hotline at 1-866-815-7004 to order the fireplace mantles are actually getting the imported hi-tech *Fireless Flame* HEAT SURGE miracle heaters for free.

no chimney and no vent. You just plug them in.

The *Fireless Flame* looks so real it amazes everybody because it has no real fire. So what's the catch? Well, soft spoken Amish craftsmen who take their time hand building the mantles have a process that forces a

strict household limit of 2 to keep up with orders.

"We can barely keep up ever since we started giving heaters away free. With winter just around the corner, everyone's trying to get them. Amish craftsmen are working their fingers to the bone to be sure everyone gets their delivery in time for Christmas," confirms Frederick Miller, National Shipping Director.

"These portable Roll-n-Glow Fireplaces are the latest home decorating sensation. They actually give you a beautifully redecorated room while they quickly heat from wall to wall. It's the best way to dress up every room, stay really warm and slash your heat bills all at the same

time," says Josette Holland, Home Makeover Expert.

And here's the best part. Readers who beat the 7-day order deadline are getting their imported hi-tech miracle heaters free when encased in the Amish built real wood fireplace mantles. The mantles are being handmade in the USA right in the heart of Amish country where they are beautifully hand-rubbed, stained and varnished.

You just can't find custom made Amish mantles like this in the national chain stores. That makes the oak mantle a real steal for just two hundred ninety-eight dollars since the entire cost of the miracle heater is free.

This free giveaway is the best way to slash heating



JUST ANNOUNCED: The Heat Surge miracle fireplace has earned the prestigious Good Housekeeping Seal. The product has earned the Seal after evaluation by the Good Housekeeping Research Institute.

HEAT SURGE™ Fireless Flame™

How It Works: The HEAT SURGE miracle heater is a work of engineering genius from the China coast so advanced, you simply plug it into any standard outlet. It uses only about 9¢ of electric an hour on the standard setting. Yet, it produces up to an amazing 5,119 BTU's on the high setting. So watch out, a powerful on board hi-tech heat turbine silently forces hot air out into the room from the vent so you feel the bone soothing heat instantly. It even has certification of Underwriters Laboratories coveted UL listing. It also comes with a limited full year replacement or money back warranty less shipping plus a 30-Day Satisfaction Guarantee. OH and FL resident transactions require the remittance of applicable sales tax. Sorry no shipments to MA residents.



LISTED: E322174



How to get 2 free heaters

The National Toll Free Hotlines are now open. All those who beat the 7-day order deadline to cover the cost of the Amish made Fireplace Mantle and shipping get the HEAT SURGE miracle heater free.

A strict limit of 2 per household has been imposed. Since some home woodworkers want to build their own mantle piece, they are letting people get the imported miracle heater alone for just \$249. Or, with the Amish made mantle you get the miracle heater free.

Use the map below to locate the weather zone you live in and call the Hotline number for your zone.



Claim Code: FP9200

EVERYONE LIVING IN THE

Frigid Zone: 1START CALLING AT
8:00 A.M. TODAY

1-866-815-7004

EVERYONE LIVING IN THE

Gold Zone: 2START CALLING AT
8:30 A.M. TODAY

1-866-815-7110

EVERYONE LIVING IN THE

Frost Zone: 3START CALLING AT
9:00 A.M. TODAY

1-866-815-7112

FOR HEAT SURGE, 8000 FREEDOM AVE., N. CANTON OH 44720

©2009 HEAT SURGE, LLC P4724A 0F9011R-1



■ **ON THEIR WAY:** Early Christmas orders have turned country roads into pipelines to the big city delivery system. Everybody wants a fireplace that comes fully assembled with a handmade Amish mantle in oak or cherry finish and gets delivered by truck right to your door. All you do is plug it in.

bills and stay warm this fall and winter. The HEAT SURGE Roll-n-Glow Fireplace gives you zone heating and all the beauty and warmth of a built-in fireplace but rolls from room-to-room so it can also save you a ton of money on heating bills.

Even people in California and Florida are flocking to get them so they may never have to turn on their furnace all winter. And since it uses

only about 9 cents of electric an hour on the standard setting, the potential savings are absolutely incredible.

"We are making sure no one gets left out, but you better hurry because entire communities of Amish craftsmen are straining to keep up with demands. For now, we are staying out of the large national retail stores in order to let readers have two per household just as long as they call before the

deadline," confirms Miller.

It's a really smart decision to get two right now because for only the next 7 days you get both miracle heaters free. That's like putting five hundred bucks right in your pocket and you can save even more money on your monthly heating bills.

"Everyone's calling to get one but those who are getting their Christmas shopping done early are surprising the whole family by getting

two. So when lines are busy keep trying or log onto amishfireplaces.com. We promise to get to every call. Then we can have a delivery truck out to your door right away with your beautiful Heat Surge Roll-n-Glow Fireplace," Miller said.

"You'll instantly feel bone soothing heat in any room. You will never have to be cold again," he said. ■

On the worldwide web:
www.amishfireplaces.com

Rolls anywhere to throw an instant heat wave with no chimney, no vents, no wood and no smoke



■ **EASILY ROLLS ANYWHERE:** This is the portable Roll-n-Glow® Fireplace that easily rolls from bedroom to living room to keep you warm. No vents, no chimney and no tools. Just plug it in.



■ **SAVES ON BILLS:** Everyone can get low bills and stay warm and cozy. The Roll-n-Glow Fireplace saves a ton of money and makes your front room look like a million bucks.



■ **SAFE FLAME:** The Fireless Flame looks so real it fools everyone but there is no real fire. That makes the flame window safe to the touch under the watchful eye of a parent. It's where the kids will play and the cat and dog will sleep.



■ **FREE:** Get this \$249 miracle heater free. It is being given away free to all who beat the 7-day order deadline for your choice of the oak or cherry finish Amish Mantles. The free heater comes already encased.

BUYER'S GUIDE

For advertising rates call Angela Hronopoulos (212) 649-2930, fax: (646) 280-2930.

NEW! Vantage Vue Weather Station

Rugged.
Accurate.
Reliable.
And a Great Price.



ISO 9001 CERTIFIED COMPANY

An easy-installing station from the company that sets the standard in quality.

- Wind, rain, temperature, humidity, barometric pressure and much more
- Unique Weather Center function provides historical data for each weather variable
- Solar-powered
- 1,000 ft. (300 m) wireless transmission is up to 3x farther than the competition
- 2.5 second updates are up to 10x faster than competing stations

\$395 MSRP

POM0911

www.vantagevue.com • 1-800-678-3669 **Davis Instruments**

TerraTrike
RIDE IN COMFORT

World's Most Comfortable Ride



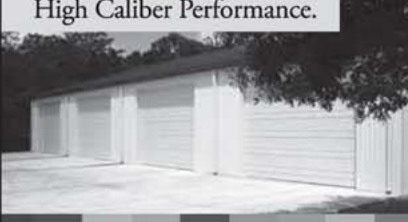
WWW.TERRATRIKE.COM
FREE CATALOG 800-945-9910

GREAT SPACE ADDITIONS FOR EVERY BACKYARD AND GARDEN



Future Steel Buildings Call for your **FREE** Brochure
www.FutureSteel.com **1-800-668-5111 x1530**

High Caliber Buildings.
High Caliber Performance.



When your building is working properly, everything else just falls into place. **Call Heritage today for your high performance metal building.**

HERITAGE BUILDING SYSTEMS.
Established 1979

1.800.643.5555 | HeritageBuildings.com

Metal Spiral



Spiral Stair Kits

Add beauty & space saving functionality to any room.

Oak Spiral



Victorian One Spiral



THE IRON SHOP®
The Leading Manufacturer of Spiral Stair Kits®

Call for the **FREE** color Catalog
1-800-523-7427 Ask for Ext. PM
or visit our Web Site at
www.TheIronShop.com/PM

MATHTUTORDVD.COM
Press Play For Success

Having Math Problems? WE CAN HELP!

SUBJECTS:

- BASIC MATH
- BASIC MATH WORD PROBLEMS
- PRE-ALGEBRA
- ALGEBRA 1 & 2
- ALGEBRA WORD PROBLEMS
- ADVANCED ALGEBRA
- GEOMETRY
- TRIG/PRECALCULUS
- CALCULUS 1, 2, 3
- PHYSICS

Subjects Coming Soon: Matrix Algebra, Unit Conversions, and Probability/Statistics.

AVERAGE COURSE LENGTH: 8 HOURS
MOST COURSES COST ONLY \$26.99

VISIT OUR WEBSITE TO VIEW SAMPLE VIDEO CLIPS OF EVERY COURSE

#1 Rated Math & Physics Tutorial DVDs

All topics taught entirely through worked example problems.

Raise grades or your money back
877-MATH-DVD

Visit: MathTutorDVD.com/pm

FREE Shipping

Expand your profitability with Badge-A-Minit buttons. Using our **Starter Kit** you can create customized buttons for customers. Buttons cost less than 17¢ to make and can be sold for \$1 or more. For only ~~\$25.95~~ **\$29.95**, receive everything you need to make your first ten 2 1/4" buttons.

Request your **FREE** catalog or order today!

www.badgeaminit.com

Badge-A-Minit™

Badge-A-Minit, Dept. PM1109, 345 N. Lewis Ave., Oglesby, IL 61348

Call 800-223-4103

Great Investment



Maintenance-Free • Savings Up to 60%
High Quality American Steel Span buildings make a great investment, perfect for workshops, ideal for garages.

www.steelspan.com
800-891-6733 ext 036

©2009 King Solomon Creative Enterprises Corp.

VIAGRA®
Cialis® LEVITRA®

Propecia, Valtrex, Xenical and more...

FREE SHIPPING COUPON CODE **POPMECH09**

OVER 1.5 MILLION ORDERS PROCESSED
CELEBRATING
10 YEARS
OVER 1.5 MILLION ORDERS PROCESSED

VIAMEDIC®
SAFE • SECURE • DISCREET

ORDER NOW! Se habla español

WWW.VIAMEDIC.COM
800-547-9903

Coupon Expires 12/31/09



**COLLECT ACRES OF LEAVES
— WHILE YOU RIDE!**

The **DR® LEAF and LAWN VACUUM** turns your riding mower into a powerful yard clean-up machine!

VACUUMS leaves, grass clippings, and other debris from your lawn using an incredible 85 mph suction force!

SHREDS most everything it vacuums. Reduces the volume of leaves by 90%.

DUMPS or BAGS collected material.

CHIPS fallen tree branches and prunings up to 2" thick with a built-in chipper.



**PLUS NEW
WALK-BEHIND
MODELS**

Get a **FREE DVD and Catalog!**



TOLL FREE
800-656-1629
DRleafvac.com

66784X © 2009

Fasten wiring WHEREVER you need to!

No need for mechanical fasteners like clips, clamps or screws. **Simply Peel-n-Stick!**



Wirestrap Sticks To:

Most Household & Industrial Surfaces

- Metals - Bare, Painted & Powder-Coated
- Plastics - Polyethylene, PVC, ABS, Etc.
- Glass, Tile, Laminates, Composites
- Wood - Finished & Unfinished

3M 300MP High-Performance Acrylic Tape

US Patents: 5,827,589 & 6,331,335
Made in the USA

wirestrap
peel-n-stick wire fastener

Toll Free: (866) 677-6665 or Visit:
www.wirestrap.com



FIVE MINUTE FENCE STAIN

Stain 100 feet of fence in just 5 minutes! Sprayer attaches directly to garden hose. No masking, simply hose off over-spray. One quart covers 600 square feet. Select from three natural wood tones: Natural Cedar, Dark Cedar or Redwood.

www.FiveMinuteFence.com

Searching For New Products? BRAND NAME WHOLESALE CLOSEOUTS

- Brand name closeouts from over 200 leading liquidators.
- Over \$450 million in wholesale closeouts at up to 90% off original wholesale prices.
- Liquidated products from hundreds of bankrupt / overstocked department stores, luxury retailers, consumer electronic chains, catalogers, importers, manufacturers and government surplus.
- Liquidations for sale to retail consumers.
- Liquidations for sale to resellers including retailers, wholesalers, dollar stores, exporters and online auctions.
- Weekly updates on thousands of North American liquidations and closeouts.
- A directory of leading North American liquidators.

LEVIS® • GUESS® • POLO® • NIKE® • REEBOK® • CK® • DONNA CARAN®
GUCCI® • ARMANI® • PANASONIC® • SHARP® • AVON® • SONY® • IBM®
HEWLETT PACKARD® • COMPAQ® • MOTOROLA® • TOSHIBA® • CANON®
REVLON® • KODAK® • REMINGTON® • GILLETTE® • FUJI® • GE®

Visit **www.webcloseout.com**

© Copyright 2009, Webcloseout

**Brand Name
Closeouts**

for
On-Line Auctions
Export • Wholesale
Retail • Flea Markets



Webcloseout.com®

SEX. It's Never Too Late To Learn Something New.™

See for Yourself on Discreet Home Video.

**EXPLICIT & UNCENSORED! REAL PEOPLE
DEMONSTRATING REAL SEXUAL TECHNIQUES!**

Couples who watch together not only LEARN from what they see, but often report that the videos themselves are an 'instant aphrodisiac.' That's because they show REAL couples (not actors) demonstrating the joys of REAL lovemaking.

**Better
Sex**
for a
Lifetime **5**

Recommended by leading doctors and therapists, all 4 videos in the series were created to show men and women in their 40s, 50s (and older) that the BEST SEX OF THEIR LIVES... can be enjoyed right now!

These videos show couples how to overcome sexual problems so common with middle age, including: erectile dysfunction... reentering the dating scene ...and rekindling passion when sex has become boring or predictable.

You'll see explicit demonstrations of imaginative sensual foreplay and lovemaking ... new positions to try... experimenting with 'forbidden' fun... 'self-pleasure' alone and together... plus finding humor and joy in a long-term loving relationship.

Real loving couples show you how to make your wildest fantasies come true!

See explicit instruction for intimate lovemaking beyond intercourse ... oral loving... ultra-sensual massage... erotic fantasy... couples pleasure products... plus specific positions that guarantee stimulation AND satisfaction!

**50% OFF 4
BETTER SEX VIDEOS!**

**100%
SATISFACTION
GUARANTEED!**



50% OFF 4 BETTER SEX VIDEOS!



Plus, 2 FREE VIDEOS!

For Fastest Service With
Credit Card: CALL TOLL-FREE

1.800.955.0888

Ext. 8PM23
(24 Hrs. / 7 Days)

mail to: **Sinclair Institute**, ext. 8PM23, PO Box 8865, Chapel Hill, NC 27515

The Art of Oral Sex (Free with Purchase) AND
The Art of Sexual Positions (Free with Purchase) #3766

**FREE
FREE**

Discreet, Plain Packaging Protects Your Privacy

- ☐ Vol. 1 Sex & Love: Lasting Pleasures #2149 \$14.95
- ☐ Vol. 2 Advanced Sex Techniques #2150 \$14.95
- ☐ Vol. 3 Sex Play & Positions #4124 \$14.95
- ☐ Vol. 4 Expanding Sexual Pleasures #4125 \$14.95
- ☐ Buy The 4-Volume Set and SAVE 50%! #5482 **\$29.90**

Check one:

☐ VHS or ☐ DVD

subtotal \$

shipping and handling \$ 6.00

TOTAL \$

Name

Address

City

State

Zip

Signature

METHOD OF PAYMENT

☐ Bank Money Order ☐ Check ☐ VISA ☐ MC ☐ Discover ☐ AMEX

Card#

Exp. date

NC orders please add 7.75% sales tax. Canadian Orders add U.S. \$7 shipping
Sorry - no cash or C.O.D. 8PM23 ©2009 Sinclair Institute.

(I CERTIFY THAT I AM OVER AGE 18)

**SINCLAIR
Institute™**

The Art of Oral Sex is guaranteed to increase your lovemaking pleasure.

The Art of Sexual Positions shows you even more creative ways to ignite intense sexual excitement. Get both videos **FREE** when you order today!

WARNING: The Better Sex For A Lifetime 5 Video Series is highly explicit and intended for adults over the age 18 only.

order online at:

BetterSex.com™/ad

Use source code 8PM23 at checkout to receive your **FREE** videos and \$6.00 S&H.



STATEMENT OF OWNERSHIP,
MANAGEMENT AND CIRCULATION

1. Publication title: Popular Mechanics
2. Publication no. 0032-4558
3. Filing date: October 1, 2009
4. Issue frequency: Monthly
5. No. of issues published annually: 12
6. Annual subscription price: \$24.00
7. Complete mailing address of known office of publication:
300 W. 57th Street, New York, NY 10019,
Contact Person: Deborah Cameron, Telephone: 212-649-2761
8. Complete mailing address of headquarters or general business
office of publisher: 300 W. 57th Street, New York, NY 10019
9. Full names and complete mailing addresses of publisher, editor,
and managing editor: Publisher: Hearst Communications, Inc.,
300 W. 57th Street, New York, NY 10019 Editor: James B.
Meigs, 300 W. 57th Street, New York, NY 10019 Publisher:
William Congdon, 300 W. 57th Street, New York, NY 10019
10. Owner: Hearst Communications, Inc., registered office, 1209
Orange Street, Wilmington, Delaware 19801—Stockholders own-
ing or holding 1 percent or more of the total amount of stock of
Hearst Communications, Inc. are: Hearst Holdings, Inc. and CDS
Global, Inc.
11. None
12. Not applicable
13. Publication title: Popular Mechanics
14. Issue date for circulation data below: October 2009
15. Extent and nature of circulation: Average no. copies each
issue during preceding 12 months

A. Total number of copies (net press run):	1,430,969
B. Paid circulation (By mail and outside the mail):	
1. Mailed outside-county paid subscriptions stated on PS form 3541 (Include paid distribution above nominal rate, advertiser's proof copies, and exchange copies):	1,028,537
2. Mailed in-county paid subscriptions stated on PS form 3541 (Include paid distribution above nominal rate, advertiser's proof copies, and exchange copies):	n/a
3. Paid distribution outside the mails including sales through dealers and carriers, street vendors, counter sales, and other paid distribution outside USPS®	126,628
4. Paid distribution by other classes of mail through the USPS (e.g. First-class mail®)	n/a
C. Total paid distribution [Sum of 15b(1), (2), (3), and (4)]:	1,155,164
D. Free or nominal rate distribution (By mail and outside the mail):	
1. Free or nominal rate outside-county copies included on PS form 3541	55,746
2. Free or nominal rate in-county copies included on PS form 3541	n/a
3. Free or nominal rate copies mailed at other classes through the USPS (e.g. First-class mail)	n/a
4. Free or nominal rate distribution outside the mail (Carriers or other means):	2,305
E. Total free or nominal rate distribution [Sum of 15d (1), (2), (3) and (4)]:	58,051
F. Total distribution (Sum of 15c and 15e):	1,213,215
G. Copies not distributed (See instructions to publishers #4 (page #3)):	217,753
H. Total (Sum of 15f and 15g):	1,430,969
I. Percent paid (15c divided by 15f times 100):	95.2%

No. copies of single issue published nearest
to filing date

- | | |
|--|-----------|
| A. Total number of copies (net press run): | 1,414,300 |
| B. Paid circulation (By mail and outside the mail): | |
| 1. Mailed outside-county paid subscriptions stated on
PS form 3541 (Include paid distribution above nominal
rate, advertiser's proof copies, and exchange copies): | 1,013,091 |
| 2. Mailed in-county paid subscriptions stated on PS
form 3541 (Include paid distribution above nominal rate,
advertiser's proof copies, and exchange copies): | n/a |
| 3. Paid distribution outside the mails including sales
through dealers and carriers, street vendors, counter
sales, and other paid distribution outside USPS® | 142,000 |
| 4. Paid distribution by other classes of mail through the
USPS (e.g. First-class mail®) | n/a |
| C. Total paid distribution
[Sum of 15b(1), (2), (3), and (4)]: | 1,155,091 |
| D. Free or nominal rate distribution (By mail and outside the mail): | |
| 1. Free or nominal rate outside-county copies included
on PS form 3541 | 58,909 |
| 2. Free or nominal rate in-county copies included on
PS form 3541 | n/a |
| 3. Free or nominal rate copies mailed at other classes
through the USPS (e.g. First-class mail) | n/a |
| 4. Free or nominal rate distribution outside the mail
(Carriers or other means): | 2,381 |
| E. Total free or nominal rate distribution
[Sum of 15d (1), (2), (3) and (4)]: | 61,290 |
| F. Total distribution (Sum of 15c and 15e): | 1,216,381 |
| G. Copies not distributed
(See instructions to publishers #4 (page #3)): | 197,919 |
| H. Total (Sum of 15f and 15g): | 1,414,300 |
| I. Percent paid (15c divided by 15f times 100): | 95.0% |
16. Publication of Statement of Ownership Publication required.
Will be printed in the November 2009 issue of this publication.
 17. Signature and title of Editor, Publisher, Business Manager or
Owner: William Congdon, Publisher

I certify that all information furnished on this form is true and complete.
I understand that anyone who furnishes false or misleading information
on this form or who omits material or information requested on the
form may be subject to criminal sanctions (including fines and impris-
onment) and/or civil sanctions (including civil penalties).

superbrightleds.com

Component LEDs - LED Replacement Bulbs - LED Accent Lighting

Super Bright LEDs Inc. St. Louis, Missouri - USA superbrightleds.com

Stuttering Didn't Silence His Story.

20/20's John Stossel knows news. He also knows what it's like to deal with a stuttering problem. John still struggles with stuttering yet has become one of the most successful reporters in broadcast journalism today.



For more information on what you can do about stuttering, write or call us toll-free.

THE
**STUTTERING
FOUNDATION®**
A Nonprofit Organization
Since 1947—Helping Those Who Stutter

800-992-9392

www.stutteringhelp.org

3100 Walnut Grove Road, Suite 603 • P.O. Box 11749 • Memphis, TN 38111-0749

LIVE HEALTHY AND GREEN

Means testing your
home for Radon.

www.epa.gov/radon

MDMShelters.com RHINO SHELTER

Protection
Industrial Grade by Rhino Shelter
10oz Fabric
Black Inner Scrim
UV-Treated
Rip-Stop

\$49900*
12 x 20 x 8
House & Round

\$31800*
Cycle Enclosure

\$179900*
22 x 24 x 12
Two-Car

\$89900*
14 x 24 x 10
Boat/SUV

\$119900*
14 x 30 x 12
Utility

\$269900*
30 x 30 x 15
Three-Car

We Sell COMPLETE Garage Kits
FREE ANCHORS
FREE ZIPPER DOORS (front & back)
FREE ROLL UP DOOR KIT (14 feet tall and up)
NO EXTRAS TO ORDER

• Easy Bolt Together
Galvanized Steel Frames
• Free Door Hold-backs
• 30 Day Money Back Guarantee
• Many Sizes & Colors in Stock

Dealer Inquiries Welcome

Visit our new site
www.RhinoShelters.com

Easy Assembly
plus SH

CALL NOW!
1-800-447-7079
Outside the USA
Call
(203) 877-7070
7 DAYS A WEEK • DEALER INQUIRIES WELCOME

BIOLOGIST'S PHEROMONES INCREASE AFFECTION



Created by
Winnifred Cutler,
Ph.D. in biology
from U. of Penn,
post-doc at
Stanford.
Co-discovered
human
pheromones in
1986 (Time
12/1/86; and
Newsweek
1/12/87)

ATHENA PHEROMONES™



UNSCENTED FORMULAS FOR MEN AND WOMEN.

Vial of 1/6 oz. added to 2-4 oz. of
your fragrance, worn daily lasts
4-6 months, or use it straight.

For Women \$98.50, For Men \$99.50

Wes (LA) "This stuff is mind-boggling. I had
three girls almost fight over me at lunch the
other day!"

Sammy (email) "The 10X seems really effective.
My wife would do things she never would have
done before..we are more like a 'bee to honey'
relationship now."

Not sold in stores, Call 610-827-2200
or view the science and order online at
Athenainstitute.com PM

CLASSIFIED ADS

To reach over 9 million prospects, or for additional advertising information, call Kathleen Gleason at 888-473-0788, or e-mail: klassmark@aol.com. Thank you for choosing Popular Mechanics Classified Advertising, 512 West Burlington Ave., LaGrange IL 60525. For subscription questions, visit service.popularmechanics.com.

ALTERNATIVE TRANSPORTATION

Electric and Gas Powered Bicycles,
Bike Conversion Kits, Scooters, Minibikes,
Mopeds, Dirtbikes, ATVs,
WWW.FIVEFLAGSMOTORBIKES.COM,
(850) 941-2080

APPAREL

**SUSPENDERS WITH PATENTED
No-Slip Clip.** Free Catalog 800-700-4515.
www.suspenders.com

ARTS, CRAFTS, SUPPLIES

**WHOLESALE PRICES ON JEWELRY
CRAFT ITEMS,** Beads & Beading
Supplies, Rockhound Supplies, Belt
Buckles,
Clock Movements. Free 122 page catalog.
Eloxite: Dept. 45,
Box 729, Wheatland, WY 82201,
Ph.: 307-322-3050
Web: www.eloxite.com

AUTOMOTIVE

AMSOIL, SYNTHETIC LUBRICANTS.
Buy Direct, Register to Buy Wholesale.
Free Catalog. 1-919-269-3331.
www.synthoils.com

BICYCLES

GOLDEN EAGLE BICYCLE ENGINES
2 & 4 Cycle Geared Belt 25 - 40cc
517-410-2793
bikeengines.com

BOATS, OUTBOARDS, TRAILERS

BUILD A BOAT - Using full size patterns,
7' to 55', send \$9.95 for
NEW Catalog and Free Plans.
Glen-L, 9152 Rosecrans/PM.
Bellflower, CA 90706. 888-700-5007.
WWW.GLENL.COM/OFFER9

BOATS, OUTBOARDS, TRAILERS

**BOAT KITS - PLANS - PATTERNS -
SUPPLIES** Catalog \$5.00, Clarkcraft,
16-6 Aqualane, Tonawanda, NY 14150.
716-873-2640. www.clarkcraft.com

BUSINESS OPPORTUNITIES

Make \$500 Weekly, E-Z Assembly work.
FREE Information, Send SASE;
JDK-P Box 635,
Hopkins, MN 55343-0635

BUSINESS OPPORTUNITIES

CONCRETE CHARLIE™ SAYS:

Claim your piece of the
\$100 Billion waterproofing
industry and become a
foundation crack repair specialist.
Most Complete Training in the Industry!
Don't Wait! Territories available NOW!
Or, buy a kit and fix **your** cracks!
www.concretecharlie.com
Enter Pop. March Promo Code: 971208

\$1,000's WEEKLY mailing burglar alarm
advertisements! Free supplies/postage!
S.A.S.E.: RBM-P, Box 759,
Lake Zurich, Illinois 60047-0759.

DO-IT-YOURSELF

**BUILD YOUR OWN
HUMAN POWERED VEHICLES!**
Recumbents, trikes, lowracers, tandems,
choppers, and more.
www.ATOMICZOMBIE.com

HYDRAULIC JACK REPAIR

Manual and catalog: \$15.00
620-594-2247, Hydraulic Parts Supply,
P.O. BOX 97-PM, Sawyer, KS 67134.

**What happened to the sidewalk
"it's sinking" fix it with**
www.DIY-SlabJack.com 877-785-7223.

EDUCATION & INSTRUCTION

SOON THE GOVERNMENT
will enforce the **MARK OF THE BEAST**
as **CHURCH AND STATE** unite!
Let **THE BIBLE** identify him.
FREE BOOKS/DVDs
The Bible Says, P.O.B. 99, Lenoir City, TN 37771
thebiblesaystruth@yahoo.com
1-888-211-1715

Wrap your hands around a new career

Guitar design, repair and tech support
is an exciting, growing field.
Design and build your own instruments in
state-of-the-art manufacturing facilities.
Learn from renowned master craftsmen
in the heart of the music industry.
Shape your future at
MI's Guitar Craft Academy.
Call 1-800-255-7529 to join our next
open house and experience MI's
world-renowned hands-on
education for yourself.
GuitarCraftAcademy at MI
guitarcraft.mi.edu

ELECTRONICS

CONDUCTIVE PAINT, EPOXY
From \$12. Silver or carbon paint.
Silver epoxy. Carbon tapes.
Custom formulas available.
www.semsupplies.com
301-975-9798 (M-F).

Digital Copyguard Eliminator,
Stabilize and Restore Distorted Video.
Guaranteed to work with all
DVD and VHS Systems.
Free information Package
574-233-3053. **www.rcdst.com**

GOT TIVO?

Need Additional Recording Capacity?
Add up to 2,400 Hours of
Recording Capacity to Your
Existing TiVo/DVR!
www.DVRdaddy.com
support@DVRdaddy.com
404-592-2839.

EMPLOYMENT

LOCAL DRIVERS NEEDED!
For drive-by property surveys
www.drivedollars.com
800-322-6169, Extension 1787.

FINANCIAL

RARE COIN INVESTMENTS.
Our clients **DON'T LOSE** money! **FREE**
brochure. **DENKO** 1-877-777-1754.
BEAT THE RECESSION - Pay your bills!
Send S.A.S.E. to JT, P.O. Box 78816,
Los Angeles, CA 90016
or **www.abm 5475.com**

FOR INVENTORS

**PATENT YOUR BRILLIANT
INVENTION!!!**
Registered Patent Attorneys
Available to Assist You
New York and New Jersey Offices
Call (646) 373-2504 or Email:
INFO@PATENTANDTAXLAW.COM
EVER HAVE A DREAM?
We'll help you make it come true.
Inventions or New Ideas.
Let's bring them to life.
205-960-1542,
www.ideamagik.com

FOR INVENTORS

DEAL DIRECTLY WITH REGISTERED PATENT AGENT and qualified US Patent Office Examiner
Don't be fooled by phonies, Free patent information –
"Patent, Develop, Market Your Invention".
Richard L. Miller 631-499-4343,
1-800-242-9853,
<http://www.pto-ag.com>

HEALTH

FOOT PAIN?

Podiatrist designed Orthotic sold by Doctors,
will relieve most foot pain for \$49.95.
For more info
www.HexCelProTech.com
201-847-7724.

HEARING AIDS

HEARING AIDS - GUARANTEED LOWEST PRICES! No huge commissions.
Home trial, terms. All makes.
We're the oldest, biggest, best.
Custom instrument specialists.
Free information, 1-800-323-4212.
Lloyds-PMC

FREE HEARING AID CATALOG. CUSTOM DIGITAL AND PROGRAMMABLE.
HUGE SAVINGS. 45 DAY TRIAL. BETTER HEARING, PO BOX 219 DEPT 32, BROOKPORT, IL 62910.
1-800-320-3300 Ext. 32

DIGITAL HEARING AID SALE
16 channel bands, any size, any type or BTE \$339.95
Options: touchtone, twin mics, custom molded - \$50.00
New! Open Fit Technology - most brands - big discounts
Repairs \$77.00 (since 1981)
Free brochure & mold kit
Hearing One 1-800-249-4163
100 Main Street, Marty SD 57361

HELP WANTED

\$400 WEEKLY ASSEMBLING Electronic Circuit Boards/Products. Rush S.A.S.E.:
Home Assembly - PM, P.O. Box 450,
New Britain, CT 06050-0450.

HOMEWORKERS NEEDED! Top pay for assembling products. Rush S.A.S.E.:
HIS-PM, Box 5657, Clearwater, FL 33758.

INVENTORS

PROTECT YOUR IDEA!
Write Your Own Patent Application
PatentPro® Software
www.patentpro.us

ATTENTION INVENTORS

Do you have a new product idea that you would like to develop?
Check us out. Free information.
www.developYOURidea.com

INVENTORS

INVENTORS: Free information tells how to offer your invention for sale or license.
Kessler Corporation, 52+ years
800-537-1133, ext. 25,
www.kesslercorp.com

YOUR FAVORITE PATENT ON A MUG,
Mousepad, t-shirt and more.
Great gift idea! **www.brag-o-matic.com**

LAKES & PONDS

LAKE OR POND? Aeration -
1st Step towards improved water quality.
Complete Systems \$169 - \$329
11,000 Gal. Per Hour Water
Fall Pump only 3.6 amps! Just \$399.95
www.fishpondaerator.com
608-254-2735 Ext. 3

LIVE STEAM MODELS

WORKING STEAM ENGINES!
Discounts! Accessories, Parts,
Stirling Engines.
Limited Edition Tin Toys, Cars & Trains.
Catalog \$6.95 Refundable.
Yesteryear Toys Dept. PMS Box 537
Alexandria Bay, NY 13607
www.yesteryeartoy.com
1-800-481-1353.

METALWORKING

BUILD, REPAIR, RESTORE ANY METAL
Quality Hand-tools & Forming Machines
for Automotive, Aviation, Homeshop,
Sculpture, Instructional DVDs & Workshops.
20 years & still the best!
Free catalog 530-292-3506
www.tinmantech.com

OF INTEREST TO MEN

SINGLE RUSSIAN LADIES
Seek romance, marriage.
E-mail, tours, free ads for men.
Anastasia Intl. Since 1994.
HTTP://WWW.ANASTASIADATE.COM

LOVELY NICARAGUAN LADIES
seek marriage. **www.mynica.info**

MEET LOCAL WOMEN
Listen & Reply to Ads **FREE!**
FREE code 7099, 18+
Call for local #. 1-888-634-2628
www.MegaMates.com

ASIAN BRIDES! Worldwide!
Free Details/Photos!
PIC, Box 4601-PM, T.O., CA 91362.
805-492-8040. www.pacisl.com

OF INTEREST TO MEN

FREE CATALOG by mail.
Meet Christian singles.

Photos. Profiles. All ages. Since 1981.
www.nicesingles.com.
Call 931-879-4625.

SECURITY

SPYBASE.COM
MYSPLYLINK.COM

What you don't know could hurt you.
Spy Gps/Cameras/keyloggers/Digital A/V
recorders. High end technology, low price.
Retail since 1989
1-800-570-5562 (CA)

SURVEILLANCE / COUNTERSURVEILLANCE EQUIPMENT. We have it all!
Hidden cameras, bug detectors,
gps trackers, digital voice recorders.
www.spygear4u.com
877-943-2748.

SNOW GUARDS

STOP SNOW SLIDES ON METAL ROOFS!

Practically Invisible, Easy Installation,
Online Estimator.
Fast Shipping **www.snojax.com**

STEEL BUILDINGS

SHOPS, GARAGE, STORAGE, HANGERS
Buy Direct from the Manufacturer & SAVE
Call Now For Best **DEALS** in Years
800-825-0316
www.worldwidesteelbuildings.com

TREASURE FINDERS

BURIED TREASURE – Sensitive equipment allows locating from distance.
Brochure free. Simmons, Box 10057-MA,
Wilmington, NC 28404
www.simmonsscintificproducts.com

WANTED TO BUY

BUYING GOLD, SILVER, PLATINUM - ANY FORM
60 years experience. Free pricing quotes.
Top payment. 1-800-932-1010
www.preciousmetalsreclaiming.com

WATER PURIFIERS

FREE Waterwisdom Report
Shocking truths revealed.
Which water is best for you?
1-800-874-9028 waterwise.com

WINE/BEER MAKING

WINEMAKERS - BEERMAKERS.
Free Catalog. (800)841-7404. Kraus,
7850-L, Independence, Missouri 64054.
www.eckkraus.com/offers/L.asp

THIS IS MY JOB

× ZOO VETERINARIAN

PETE BLACK
LOCATION ST. LOUIS, MO.
AGE 29
YEARS ON JOB 2

1. Thermal Camera

Black snaps a photo with this dust- and splash-proof camera that senses differences in body temperature to determine if an animal is injured: The hotter the area, the more inflamed or infected it is.

2. Surgical Table

This hydraulic table can hold up to 1000 pounds. When he's dealing with large animals, Black wheels the table out to the loading dock, puts the sedated animal on the table and takes it back to the OR.

3. Portable X-ray

Black can take this portable X-ray machine into the field, where a stand holds it in position. There is also a bigger, nonmobile unit in the hospital that provides higher resolution images.

4. Portable Ultrasound

To monitor pregnancies or look for injuries in the heart or abdomen, Black uses this portable ultrasound device. The 8-pound unit comes with four different transducers and an 8-inch color LCD display.

5. Dart Gun

Black uses a dart gun—loaded with drugs 10,000 times more potent than morphine—to sedate animals too dangerous to approach.

6. Endoscopes

The less invasive a surgical procedure, the more quickly an animal will recover. Black uses these flexible endoscopes, which are outfitted with a camera and have slots for instruments, to take biopsies or grab foreign objects out of the stomachs of animals. The largest is 9 feet long; the smallest is only 2 feet.



The African redneck ostrich weighs 350 pounds, runs in bursts up to 40 mph and can eviscerate a person with a powerful kick. And last year, Pete Black had to catch them. "It was a rodeo at times," he says of the research expedition to Africa, "but no one got seriously injured." Black works for the St. Louis Zoo, where his primary responsibility is to perform routine exams and surgeries and provide preventative care to the zoo's 5000 animals. Black makes house calls to animals' enclosures and works within the confines of the 17,000-square-foot hospital. "A lot of the species we work with are endangered, or dangerous, or both," Black says. "Making sure things are safe for them—and for us—is challenging." —ERIN MCCARTHY

WOULD YOU RATHER HAVE A CLAIM OR A GUARANTEE?



ONLY VALVOLINE GUARANTEES YOUR ENGINE FOR UP TO 300,000 MILES.

It's simple: Register your car at valvoline.com before 75,000 miles and we'll guarantee your engine for up to 300,000 miles.

GET GUARANTEED AT VALVOLINE.COM

